The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B.Sc Engineering (Civil)

Course Title: Principles of Accounting | Course Code: ACN301
Time: 2 Hours | Full Marks: 50

Part-A: Short Questions
Answer any five questions

5 X 3 =15

1. What is cost accounting? Identify the objectives of cost accouting.
2. Briefly describe the components of manufacturing cost of a product.
3. Briefly explain the different types of inventory of a manufacturing organization.
4. What do you mean by break-even point? What is the main objective of CVP analysis?
5. The value of Degree of Operating Leverage (DOL) for Consult Sohana Ltd. is 6. Management of Consult Sohana Ltd. asked you to explain the meaning of DOL value. How will you interpret this value of DOL to the management of Consult Sohana Ltd.?
6. What do you mean by contract costing? How the profit of a construction contract is determined?
7. Distinguish between variable cost and fixed cost.

Part-B: Broad questions

Answer all questions

15 + 20 = 35

1. ABC Ltd. Produces and sells marker. Last income statement of the company was as follows-

	Total (Tk.)
Sales Revenue (20000 markers sold)	1,200,000
Less: Variable Expenses (20000 markers)	900,000
Contribution Margin	300,000
Less: Fixed Expenses	240,000
Net Income	60,000

From the above information compute the following-

1. Compute CM per unit, CM ratio and variable expense ratio.
2. Compute break-even point (BEP) both in units and in Taka.
3. Assume that sales will increase by Tk 400,000 next year. If the cost structure remains the same, by how much will the company's net income increase? Use CM ratio to determine your answer.
4. Refer to the original data. Assume that in the next year, the management wants to earn a target profit of Tk. 90,000. How many units will have to be sold to meet this target?
5. Refer to the original data. Compute the company's margin of safety in Taka and interpret the value of margin of safety.
6. Compute the degree of operating leverage (DOL). If company's sales increases by 5% in the next year, by what percentage would you expect the net income to increase?(Use DOL to determine your answer).
7. Company expects that the variable cost will increase by 20% in the next year and fixed cost will decrease by Tk.10, 000. Calculate the new break-even point (BEP) of the company

2. Swift Company was organized on March1, 2010. After Five months of start-up losses, management had expected to earn a profit during August. Management was disappointed, however, when the income statement for August also showed a loss. August's income statement was as follows:

SWIFT COMPANY
Income statement
For the Month Ended August 31, 2010

Sales in Tk.		450,000
Less: Operating Expenses:	Tk.	
Indirect labor cost	12,000	
Utilities	15,000	
Direct Labor cost	70,000	
Depreciation, Factory equipment	21,000	
Raw materials purchased	165,000	
Depreciation, sales equipment	18,000	
Insurances	4,000	
Rent on facilities	50,000	
Selling & Administrative Salaries	32,000	
Advertising	75,000	
Total Operating Expenses		462,000
Net operating loss		(12,000)

After seeing the 12,000 loss for August, Swift's president stated, "I was sure we would be profitable within six months, but our six months are up and this loss for August is even worse than July's. I think it's time to start looking for someone to buy out the company's assets and if we don't, do it within a few months there won't be any assets to sell. By the way, I don't see any reason to look for a new controller. We'll just limp along with Sam for time being." The company's controller resigned a month ago. Sam, who is a new assistant in the controller's office, prepared the income statement above. Sam has had little experience in manufacturing operations. Additional information about the company is given follows:

a. Some 60% of the utilities cost and 75% of the insurance cost apply for factory operations the remaining accounts apply to selling and administrative activities.
b. Inventory balance at the beginning and end of August were:

	August 1	August 31
Raw materials	Tk. 8,000	Tk.13,000
Work in process	Tk.16,000	Tk.21,000
Finished goods	Tk.40,000	Tk.60,000

c. Only 80% of the rent on facilities applies to factory operations& the remainder applies to selling and administrative activities.

The president has asked you to check over the income statement and make a recommendation as to whether the company should look for a buyer for its assets.

Required:

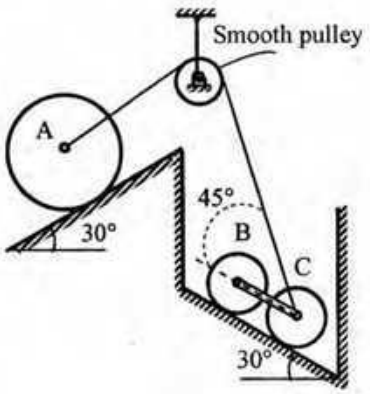
1. Prepare a schedule of cost of goods sold for August.
2. Prepare a new income statement for august.
3. Based on your statements prepared in (1) and (2) above, would you recommend that the company should look for a buyer?

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B. Sc. Engineering (Civil)

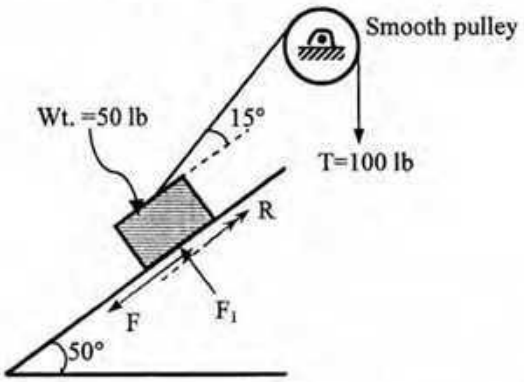
Course Title: Engineering Mechanics I | Credit Hours: 3.0 | Course Code: CE 101
Time: 3 hours | Full Marks: 100 (= 10 × 10)

[Answer **any 10 (Ten)** of the following **14 (Fourteen)** questions]

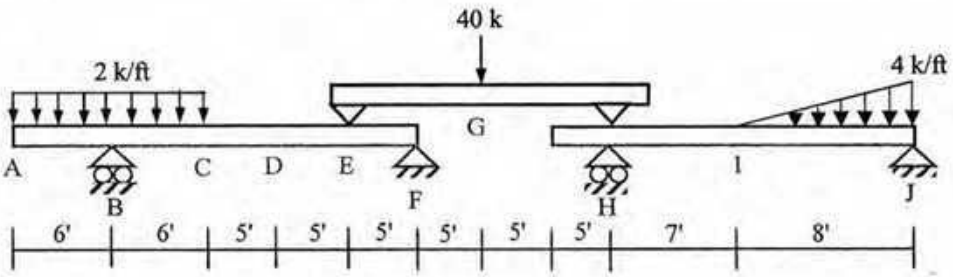
1. Determine the weight of the sphere A to keep the system in equilibrium.[Given, Wt. of sphere B and C =100 N each].



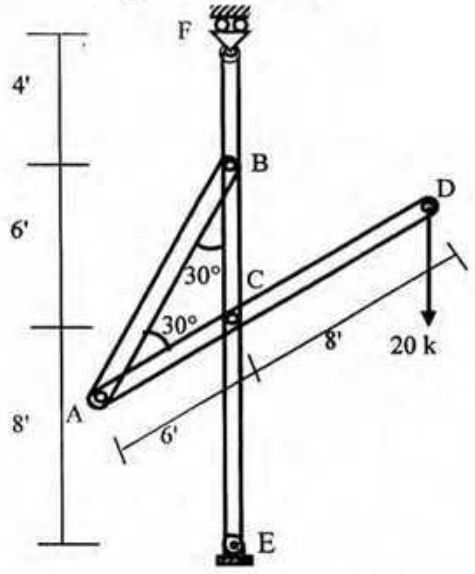
2. In the figure shown below, the frictional force F = 0.18 F_1. If R is the resultant of Wt., T, F_1 and F, calculate the magnitudes of F_1, F and R.



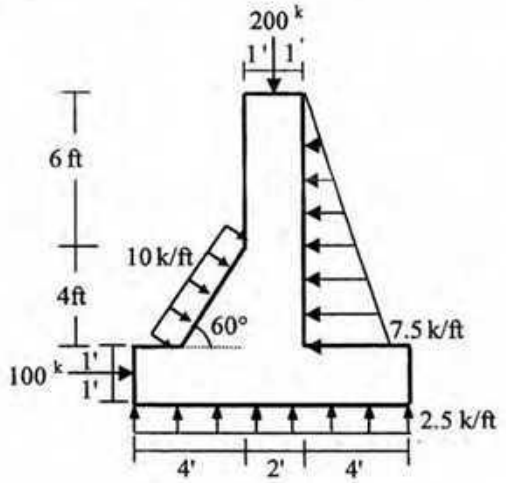
3. Determine the support reactions at **B**, **F**, **H** and **J** of the beam shown in the figure below. Also calculate the axial force, shear force and bending moment at point **D**.



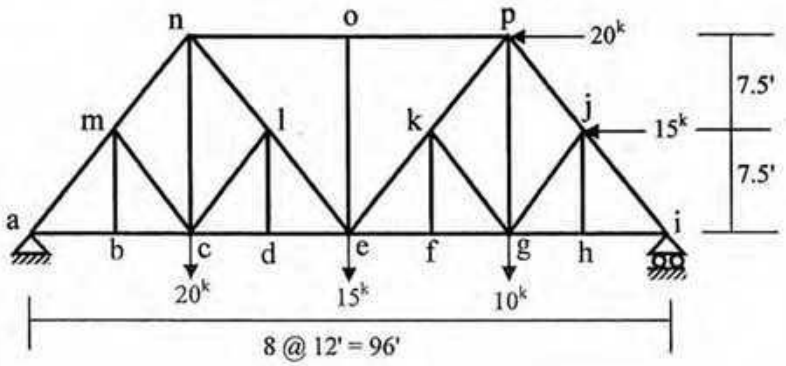
4. Determine the force in the member **AB** and support reaction at E.



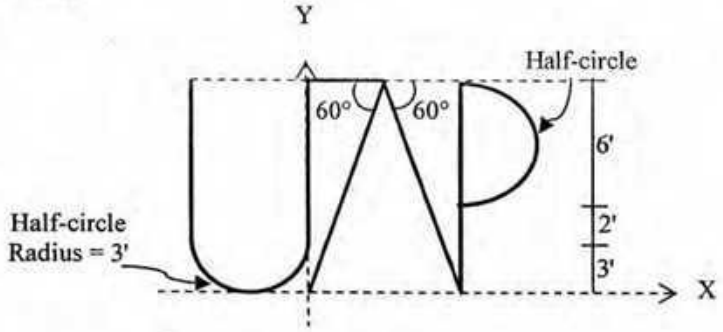
5. Calculate the magnitude, direction and location of the resultant for the following force system.



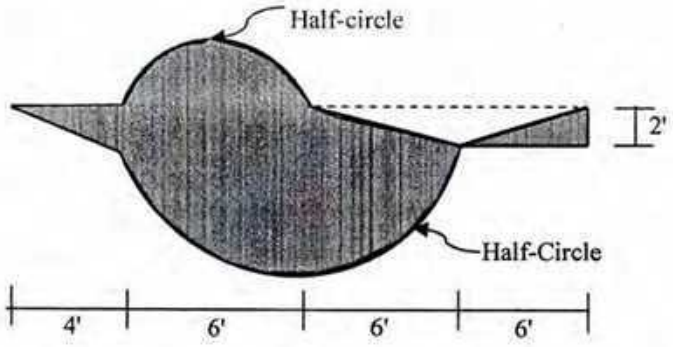
6. In the following figure, identify the zero force members. Also determine the forces in members ***gf, ld*** and ***le.***



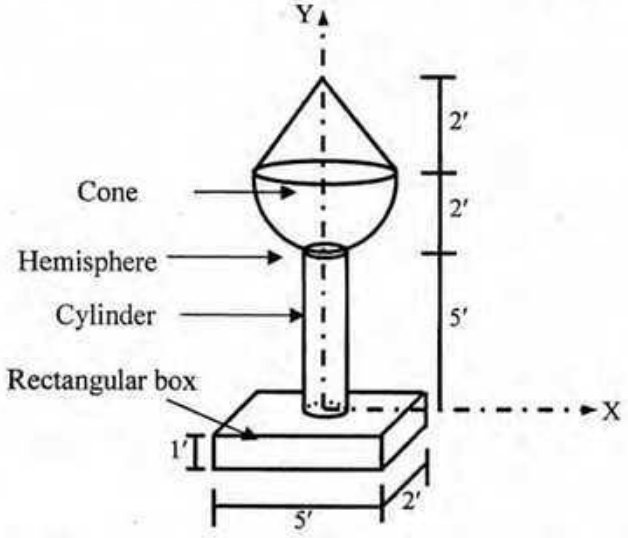
7. Locate the line centroid of the structure shown below. Half-circular members weigh 100 lb/ft and the other members weigh 150 lb/ft.



8. Locate the centroid of the shaded area shown below.

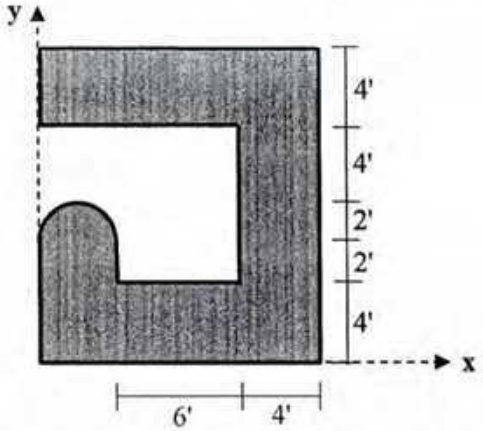


9. Locate the center of gravity of the composite body shown in the figure below. Unit weight of cone and rectangular box are 150 lb/ft^3, Unit weight of cylinder is 120 lb/ft^3, Unit weight of hemisphere is 100 lb/ft^3.

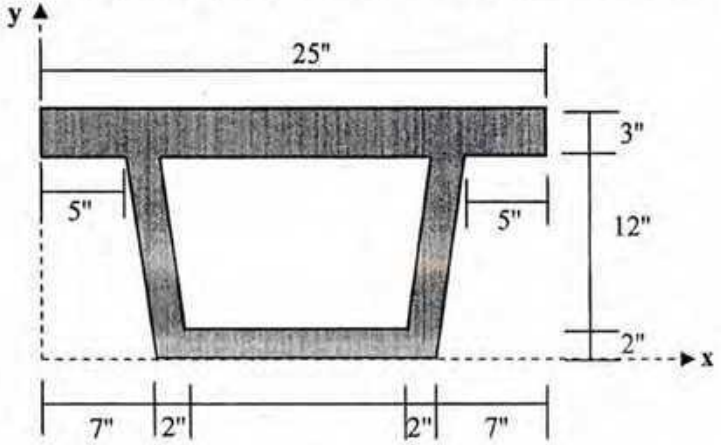


10. Locate the centroid the sector of a circle which substends a central angle 70°.

11. The centroid of the shaded area is $\bar{x}=7.56'$, $\bar{y}=7.80'$, while the centroidal moments of inertia are $\bar{I}_x=4430.56$ ft^4, $\bar{I}_y=2996.47$ ft^4. Calculate the minimum moment of inertia of the shaded area and show the corresponding principal axes.



12. In the following figure, calculate the moments of inertia of the area about the *x*-axis and *y*-axis.



13. A uniform wire weighing 1/2 lb per foot of length is supported between two points 200 ft apart on the same level and the maximum deflection is 3 ft. Determine the horizontal tension, the maximum tension, and the length of the wire.

14. A cable is to be suspended from two points distant 100 ft apart horizontally and 20 ft vertically. It is to carry a load of 500 lb per horizontal foot, and the lowest point of the curve is to be 25 ft below the lower point of support. Locate the position of the lowest point of the cord and also calculate the value of the horizontal component of the tension, and the maximum tension.

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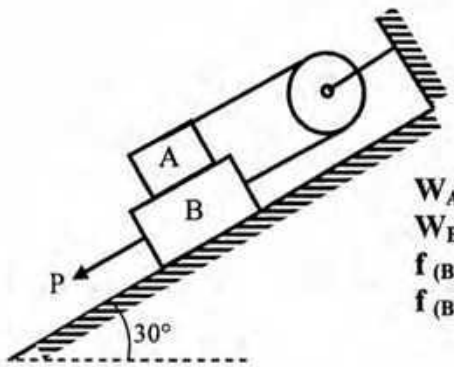
Department of Civil Engineering
Final Examination Fall 2010
Program: B. Sc. Engineering (Civil)

Course Title: Engineering Mechanics II | Course Code: CE 103
Time: 3 hours | Full Marks: 100 (= 10 × 10)

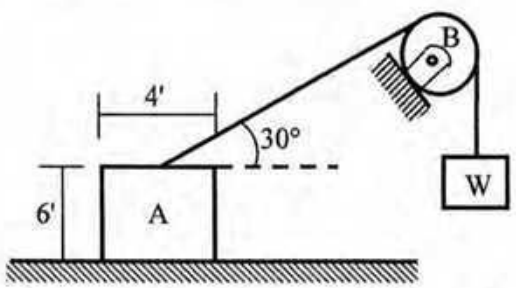
[Answer **any 10 (Ten)** of the following **14 (Fourteen)** questions]

1. Block A and block B rests on each other, connected by a cord which passes over a frictionless pulley. Determine
a) The force **P** needed to resist the down ward motion of block A.
b) The **tension** in the cord.



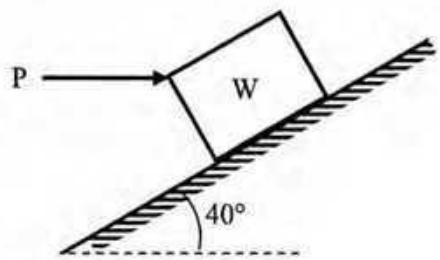
$W_A = 75^{\#}$
$W_B = 50^{\#}$
$f_{(Block\ A\ and\ B)} = 0.15$
$f_{(Block\ B\ and\ inclined\ surface)} = 0.15$

2. A homogeneous block A is connected with a block W by a cord, which passes over a pulley B. Calculate the minimum weight of **W** for the motion to impend? Will the block **tip or slip**?



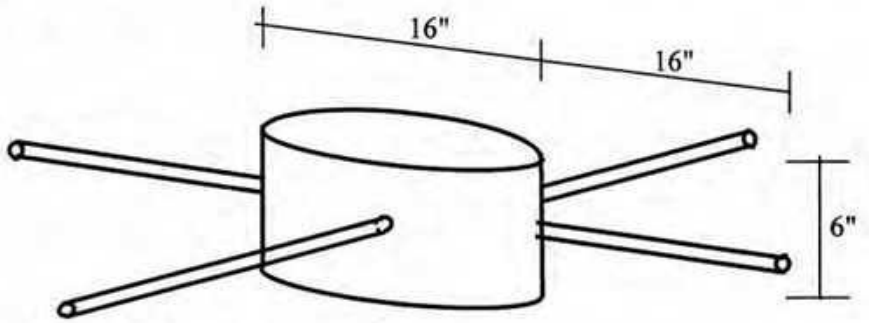
$W_A = 600^{\#}$
$f_A = 0.3$
$f_B = 0.1$

3. Determine the range of values which the horizontal force **P** may have without disturbing the equilibrium.



$W = 100^{\#}$
$f_W = 0.25$

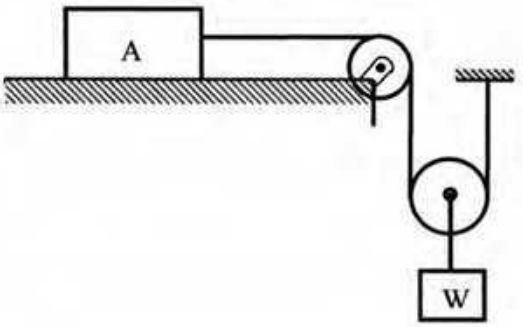
4. The solid central hub shown has four similar arms, each weighing 0.83 lb, attached as shown in the figure. Assuming the hub has a weight density of 490 lb/cft, calculate the mass moment of inertia about the vertical centriodal axis.



5. High speed photography is used to measure the displacement of a moving object. There by displacement Δs is measured by computing successive pictures taken Δt time apart.
Let $\Delta s_1 = 1"$, $\Delta s_2 = 1.5"$, $\Delta s_3 = 2.25"$, $\Delta s_4 = 3.25"$, $\Delta s_5 = 4"$, $\Delta s_6 = 4"$, $\Delta s_7 = 3"$, $\Delta s_8 = 2"$, $\Delta s_9 = 1"$, $\Delta s_{10} = 0.5"$.
Let, the exposure rate is 120 frames per second.
Plot a) **s-t** curve, b) **v-t** curve, c) **a-t** curve, d) determine $\mathbf{v_{max}}$ and $\mathbf{a_{max}}$ during the 10 frame exposure.

6. A wheel which is rotating at 300 rpm is slowing down at the rate of 2 rad/ sec^2.
   a) What time will elapse before the wheel stops?
   b) At what rate (in rpm) is the wheel revolving after 10 sec?
   c) Through how many revolutions had it turned during the first 10 sec?
   d) What is the total displacement?
   e) Compute the number of revolutions from the time 10 sec until the wheel stops.

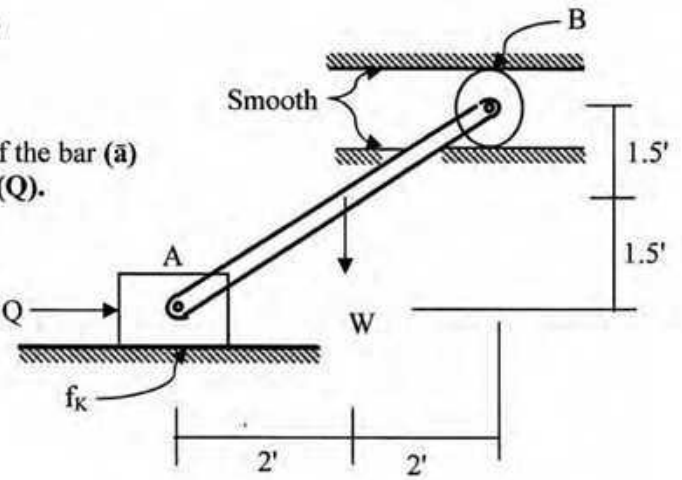
7. Block A was moving right with a velocity of 10 fps, but stops after 25 sec. What is the co-efficient of friction between the surface and the block?



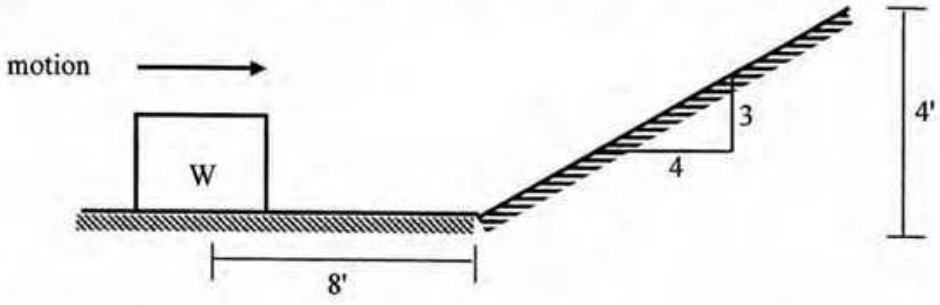
Given,
W = 50 lb
W_A= 100lb
The pulleys are smooth.

8. Given, W = 100 lb,
   R_B = 10 lb (↑),
   f_k = 0.2

   Calculate
   (a) Acceleration of the bar **(ā)**
   (b) Applied force **(Q).**



9. Calculate the **initial speed** of W if it comes to rest after climbing 4' height of the inclined surface.

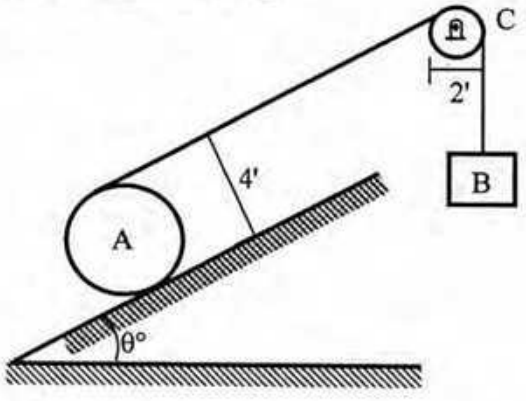


f = 1/3
for all planes

10. Disk A has a weightless cord wrapped about its mid section shown in the figure. This cord passes over a frictionless and weightless sheave C, and thence downward to a weight B.

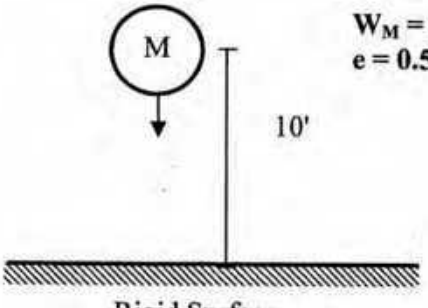
a. If the system starts from rest, determine the **final speed** of the cg of A and the **acceleration** of B.

b. What is the **tension** in the cord?



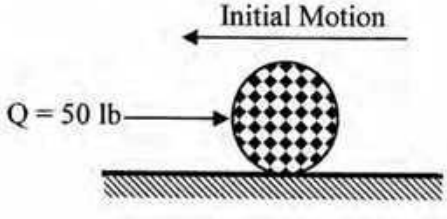
$W_A = 80^{\#}$
$W_B = 50^{\#}$
$\theta = 30°$
$\bar{I}_A = 4$ slug-ft^2
$S_B = 20$ ft

11. After impact how high will the ball rise up? Also determine the loss of kinetic energy during impact.



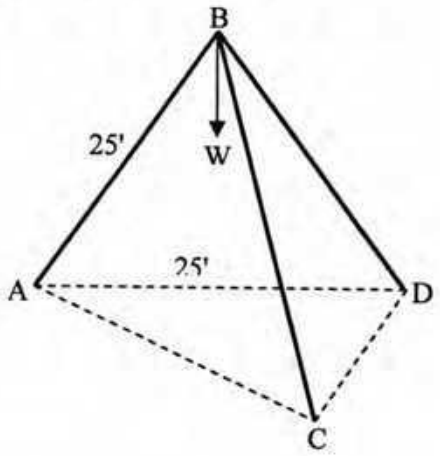
$W_M = 14$ oz
$e = 0.5$

12. A football was moving leftward with a velocity $v_1 = 50$ fps. A player kicked the ball with force Q toward the right. There is a constant resistance to the motion of F = 40 lb. What is the velocity after 20 sec?



$\text{Weight}_{\text{football}} = 1$ lb
$\text{radius}_{\text{football}} = 3$"

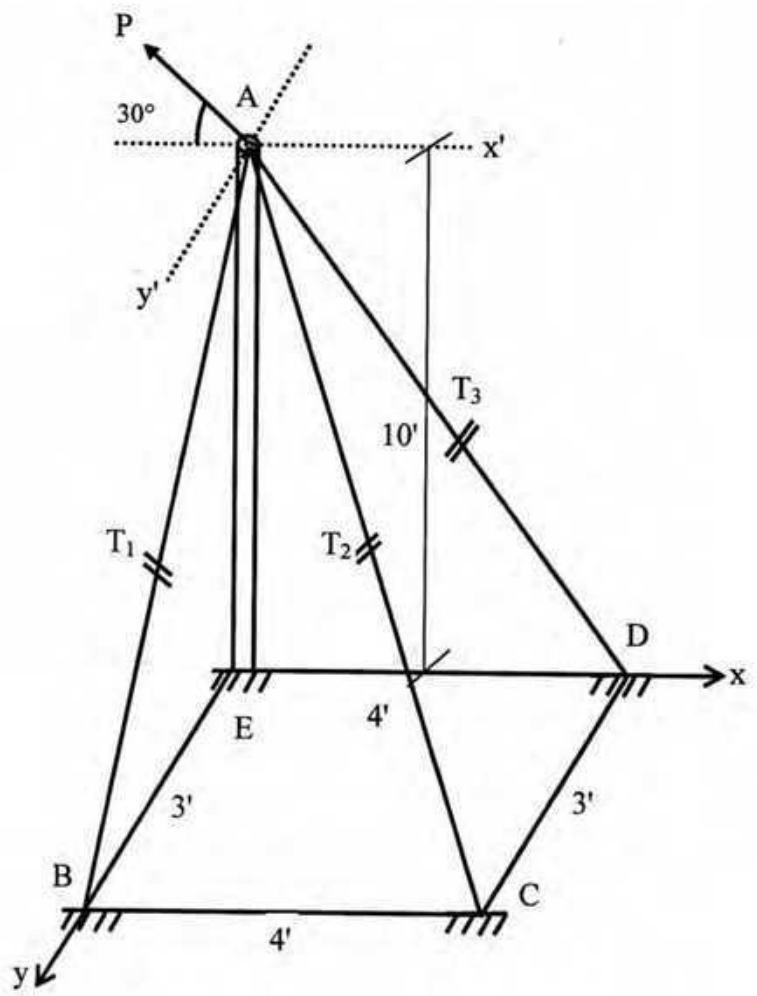
13. Three timbers, AB, BC, BD each 25 ft long form a tripod. The ends of the timbers on the ground form an equilateral triangle ACD, the sides of which are each 25 ft long. If the safe compressive load for each timber is 30000 lb, what safe load W may by suspended from point B?



14. A poll AE of 10' height is supported by three cables AB, AC and AD. The compressive force on AE is 2000 lb. Tension in chord AB, $T_1 = 250$ lb. A force P is applied at A to keep the poll in equilibrium.

Calculate

(a) $T_2 = ?$
(b) $T_3 = ?$
(c) $P = ?$



Sec-A

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B.Sc. Engineering (Civil)

Course Title: Surveying | Course Code: CE 105
Time : 3 Hours | Full Marks: 125

There are **SEVEN** questions in this section. Answer any **FIVE.**

1. (a) Explain the following terms: (5)
i) Check Line ii) Base Line
(b) Discuss the advantages and disadvantages of Plane Table Surveying over other surveying methods. (5)
(c) A steel tape 25 m long standardized at 65^0 F with a pull of 10 kg was used for measuring a base line. Find the correction per tape length, if the temperature at the time of measurement was 80^0 F and the pull exerted was 16 kg. Weight of 1 cubic cm of steel= 7.86 g, Weight of tape =0.8 kg and E = 2.109 X 10^6 kg/cm^2. Coefficient of expansion of tape per 1^0 F = 6.2×10^{-6} (15)

2. (a) What is Traverse Survey? (5)
(b) What do you understand by local attraction? (5)
(c) Below are the bearings observed in traversing with a compass in a place, where local attraction was suspected: (15)

Line	Fore Bearing	Back Bearing
AB	80^0 30'	260^0 30'
BC	351^0 15'	173^0 00'
CD	32^0 15'	208^0 00'
DE	106^0 15'	287^0 45'
EF	99^0 00'	280^0 00'
FG	209^0 30'	29^0 30'

At what stations do you suspect local attraction? Find the corrected bearings of the lines.

3. (a) What are the different sources of errors in leveling? (5)
(b) The following notes refer to reciprocal levels taken with one level: (5)

Instrument Near	Staff reading on		Remarks
	P	Q	
P	1.824	2.768	Distance PQ = 1010 m
Q	0.928	1.616	R.L of P = 126.386 m

Find (i) True R.L of Q, (ii) The combined correction for curvature and refraction.

(c) The following consecutive readings were taken with a level (15)
6.31, 4.82, 6.13, 8.44, 9.82, 6.64, 7.91, 10.41,5.42,4.21,6.57
The level was shifted after 4th, 6th and 9th readings. The reduced level at first point was 160 ft. Calculate the reduced levels of the points by using **Height of Instrument Method** and apply usual arithmetical check.

4. (a) For a simple circular curve, define (i) Tangent distance, (ii) Deflection angle, (iii) Mid ordinate, (iv) Long chord and (v) Point of curve. (5)

(b) Two tangents intersect at chainage 59+60, the deflection angle being 50°30′. Calculate the necessary data for setting out a simple circular curve of 15 chains radius to connect the two tangents if it is intended to set out the curve by offsets from chords. Consider peg interval equals to 100 links, length of the chain being equal to 20 m (100 links). (12)

(c) A transition curve is required for a circular curve of 200 m radius, the gauge being 1.5 m and maximum super-elevation restricted to 15 cm. The transition is to be designed for a velocity such that no lateral pressure is imposed on the rails and the rate of gain of radial acceleration is 30 cm/sec^3. Calculate the required length of the transition curve and the design speed. (8)

5. (a) What is transition curve? Why is it provided? What is super-elevation? (5)

(b) Two tangents intersect at chainage 59+60, the deflection angle being 50°30′. Calculate the necessary data of various chord lengths and tangential angles for setting out a curve of 30 chain radius to connect the two tangents, if it is intended to set out the curve by Rankin's method of tangential angles. Consider peg interval equals to 100 links, length of the chain being equal to 20 m (100 links). (20)

6. (a) Define (i) Vertical photograph, (ii) Oblique photograph, (iii) Tilted photograph, (iv) Tilt and (v) Flight line. (5)

(b) An area 30 km long in the north-south direction and 24 km in the east-west direction is to be photographed with a lens having 30 cm focal length for the purpose of constructing a mosaic. The photograph size is 20 cm x 20 cm. The average scale is to be 1: 12,000 effective at an elevation of 400 m above datum. Overlap is to be at least 60% and the side lap is to be at least 30%. An intervalometer will be used to control the interval between exposures. The ground speed of the aircraft will be maintained at 200 km per hour. The flight lines are to be laid out in a north-south direction on an existing map having a scale of 1: 60,000. The two outer flight lines are to coincide with the east and west boundaries of the area. Determine the data for the flight plan. (20)

7. (a) Define (i) Zenith and Nadir, (ii) Latitude and Longitude, (iii) Celestial Horizon (5)

(b) Find the zenith distance and altitude at the upper culmination of a star from the following data: declination of star = 42°15′ N and Latitude of observer = 26°40′. (5)

(c) Find the shortest distance between two places A and B. Given that the latitudes of A and B are 15°0′ N and 12°6′ N and their longitudes are 50°12′ E and 54°0′ E, respectively. Find also the direction of B on the great circle route. Radius of earth = 6370 km. (15)

Given formula:

1. $\cos P = \dfrac{\cos p - \cos a * \cos b}{\sin a * \sin b}$
2. $\tan(A+B)/2 = \cot(P/2) * \dfrac{\cos(a-b)/2}{\cos(a+b)/2}$
3. $\tan(A-B)/2 = \cot(P/2) * \dfrac{\sin(a-b)/2}{\sin(a+b)/2}$
4. $z = \delta - \theta, \quad \alpha = 90^\circ - z$
5. $T = R\tan\dfrac{\Delta}{2}, \quad l = \dfrac{\pi R\Delta}{180^\circ}, \quad \delta = 1718.9\dfrac{c}{R}$
6. $O_1 = \dfrac{c^2}{2R}, \quad O_2 = \dfrac{C}{2R}(c+C), \quad O_3 = \ldots\ldots = O_{n-1} = \dfrac{C^2}{R}, \quad O_n = \dfrac{c'}{2R}(C+c')$
7. $L_{transition} = \dfrac{v^3}{\alpha R}, \quad \Delta_s = 1719\dfrac{L}{R}, \quad \Delta_c = \Delta - 2\Delta_s, \quad L_{circular} = \dfrac{\pi R\Delta_c}{180^\circ}, \quad s = \dfrac{L^2}{24R}, \quad \tan\theta = \dfrac{v^2}{gR}$
8. $T = (R+s)\tan\Delta + \dfrac{L}{2}$
9. $s_h = \dfrac{f}{H-h}, \quad L = (1-p_l)sl, \quad W = (1-p_w)sw$
10. $a = L \times W, \quad N = \dfrac{A}{a}$
11. $N_1 = \dfrac{L_1}{(1-p_l)sl} + 1, \quad N_2 = \dfrac{L_2}{(1-p_w)sw} + 1$
12. Level Section $A = (b + nh)\, h$
13. Two-Level Section $A = \{n\,(b/2)^2 + m^2\,(b+nh)h\}/(m^2-n^2)$
14. Three-Level Section $A = \{b\,(h_1+h_2)/4 + h\,(w_1+w_2)/2\}$

    $w_i = m_i n/(m_i-n)\,(h+b/2n)$

    $h_1 = m_1 n/(m_1-n)\,(h+b/2m_1)$

    $h_2 = m_2 n/(m_2-n)\,(h-b/2m_2)$
15. $V = \dfrac{d}{6}(A_1 + A_2 + 4A_m)$

Note: Here the symbols have their usual meanings.

Sec-B

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B.Sc. Engineering (Civil)

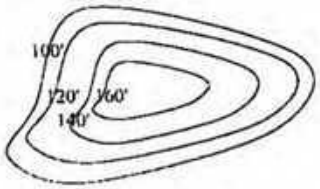
Course Title: Surveying | Course Code: CE 105
Time: 3 hrs | Full Marks: 200

There are **SEVEN** questions. Answer any FIVE questions.

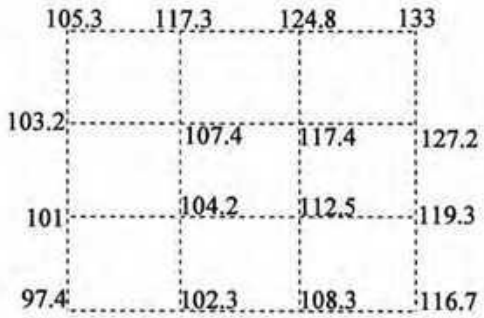
1(a) Define contour and contour interval (05)

(b) Write down five characteristics of contours. (10)

(c) Draw the elevation of the following contour: (10)



(d) Following figure shows the elevations (in m) at guide points. Draw the contour lines for the elevation of 100, 105, 115 and 125m. (15)



2(a) Calculate R.L. for all the stations and find other necessary data for filling up the following chart.(20)

Station	B. S.	I.S.	F. S.	Rise	Fall	R.L.	Remarks
1	1.185					232.460	B. M.1
2	1.12				0.03		
3		2.105					
4			2.105				
5	1.05		1.925		0.32		
6						232.310	B.M.2
7	1.690			0.33			
8			2.120				
9						233.425	B.M3
Check							

(b) A Tacheometer was set up at a station A and the readings on a vertically held staff at B were 2.255, 2.605 and 2.955, the line of sight being at an inclination of + 8° 24′. Another observation on the vertically held staff at B.M. gave the readings 1.640, 1.920 and 2.200, the inclination of the line of sight being + 1° 6′. Calculate the horizontal distance between A and B, and the elevation of B if R.L. of B.M. is 420 metres. The constants of the instruments were 100 and 0.3. (10)

(c) Describe the methods of radiation and intersection of plane tabling with proper figure. (10)

3. (a) A transition curve is required for a circular curve of 250m radius, the gauge being 2.5m and the maximum super elevation restricted to 15 cm. The transition is to be designed for a velocity such that no lateral pressure is imposed on the rails and the rate of gain of radial acceleration is 35cm/sec^3. Calculate the required length of transition curve and the design speed. (12)

(b) Define simple, complex and reverse curve. (08)

(c) For a 6° circular curve between two roads intersecting at 12°, calculate and show on the curve(i) Length of tangent (ii) Length of Long Chord (iii) Mid ordinate. Set the circular curve mentioned above by Rankine's method of Deflection Angle (i.e., calculate the necessary data and show the points of curve) using chord lengths of 50′. (20)

4(a) Calculate the necessary data to set out a vertical curve which connects an upgrade of 1% with a downgrade of 0.5%. Chainage at the point of intersection is 20.50 chains and reduced level is 210 feet. Take the rate of chains in gradient, 0.1% per chain of 100 ft length. (20)

(b) What is transition curve? What is its usage? (08)

(c) An instrument was set up at P and the angle of depression to a vane 4 m above the foot of the staff held at Q was 5°. The horizontal distance between P and Q was known to be 4000 metres. Determine the R.L. of the staff station Q, given that staff reading on a B.M. of elevation 335.50 was 2.75 metres. (12)

5(a) The following perpendicular offsets were taken from a chain line to a hedge

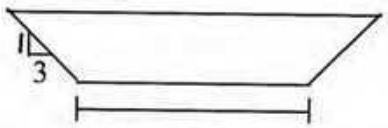
Chainage(m)	0	20	40	60	80	110	140	150
Offsets(m)	7	6.5	7.5	8	8.5	6.5	7	6

Calculate the area between the survey line, the hedge and the end offsets by Simpson's rule. (10)

(b) Write down the source of errors in leveling? (10)

(c) Calculate the volume of cut and fill from the following data if the X-section is a level section with b=15, n=3 and the construction level is 15 ft. Use both Trapezoidal and Prismoidal formula. The RLs' at different chainage of existing ground surface are shown in the next page: (20)

Chainage(ft)	0	60	200	300	400
RL(ft)	10	15	17	19	22



15ft

Cross- section

6(a) What are the objectives of surveying? What factors should be considered for deciding the stations of a chain survey? (08)

(b) Write short note on "Field Book". Write the name of instruments used in plane table surveying? (08)

(c) A steel tape is 30m long at a temperature of 65° F when lying horizontally on the ground with standardized pull 14 kg. Its cross sectional area is 0.082 sq. cm, its weight 2 kg and the coefficient of expansion $65 * 10^{-7}$ per 1°F. The tape is stretched over three equal spans. Calculate the actual length between the end graduations under the following conditions: temp 85° F, pull 18 kg. Take E= 2.109 x 10^6 kg/cm^2 (15)

(d) An engineer's chain was found to be 6 inches too short after chaining of 5000 ft. The same chain was found to be 1 ft too short after chaining a total distance of 10000 ft. Find the correct length at the commencement of chaining. (09)

7(a) The following notes refer to reciprocal levels taken with one level:

Instrument at	Staff readings on		Remarks
	P	Q	Distance between
P	2.748	1.824	P and Q= 1000m
Q	1.606	0.928	R. L of P= 125.496

Find (i) true R. L. of Q (ii) the combined correction for curvature and refraction
(iii) the angular error in the collimation adjustment of the instrument (15)

(b) Define: (i) Level line (ii) Datum (iii) Elevation (09)

(c) The following lengths and bearings were recorded in running a theodolite traverse in the counter clockwise direction, the length of CD and bearing of DE having been omitted. (16)

Line	Length(m)	R. B.
AB	281.4	S 69°11′ E
BC	129.4	N 21°49′E
CD	?	N 19° 34′W
DE	144.5	?
EA	168.7	S 74° 24′W

Determine the length of CD and the bearing of DE.

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall- 2010
Program: B. Sc. Engineering (Civil)

Course Title: Introduction to Civil & Environmental Engineering | Course Code: CE 107 | Credit: 2.00

Time: 1 hour | Full Marks: 100

There are **TWO** sections in the question paper namely "SECTION A" and "SECTION B". You have to answer from both the sections according to the instruction mentioned on each section.

SECTION A
Marks: 30

Answer any three questions:

1. How urban areas in Bangladesh are affected due to environmental problem? (10)

2. What is global warming? What are the green house gases? Explain two of them and their impacts to climate change. (10)

3. Explain different sources of air pollution. How sulfurous and photochemical smog develops? (10)

4. What are the differences between primary and secondary pollutants? Why is acid deposition a major environmental problem and how can it be minimized? (10)

SECTION B
Marks: 70

Answer all questions and follow the instructions.

(6+6+4+8=24)

1. a. Give the names in details of the following codes with their related fields,

   i. ACI ii. ASTM iii. BNBC

   b. How can you ensure satisfactory quality of brick in the field?

   c. One foreign company proposes the implementation of an international airport under build operate and transfer basis (BOT). Mention the various steps to be followed by the company during the implementation of the project.

   d. Define the following terms:

   i. Height of the building ii. Floor Area Ratio (FAR)

   iii. High rise building iv. Road width

Or

(6+6+6+6=24)

1. a. Define contract. Write down the name of various types of contract.
   b. Write down the name of few types of equipment commonly used in construction works. The use of equipments in construction work has no benefits- Do you agree with this statement, explain.
   c. Write down the organogram of Bangladesh Roads & Highways Department (RHD).
   d. Describe the road transportation network in Bangladesh.

(20)

2. The University of Asia Pacific is planning to construct a six storied building under its own supervision. As its fund is limited, the university wants to take loan from a financial institution. Financial institution provides maximum 60% loan of the total construction cost. Estimate the total construction cost and the amount of money to be borrowed as per the PWD schedule (enclosed). The particulars of the building are as follows:

Sl. No.	Items	Specifications
01	Land size	45 m x 65 m
02	Road width	15 m
03	Building type	Educational (Standard)
04	Allowable Bearing Capacity (q_a)	4.0 ksf
05	Floor Level	Six
06	Plinth Area	1400 Square meter (40 m x 35 m)
07	Type of structure	RCC Frame Structure , Concrete with Stone Chips, fc=22-25 MPa
08	Ground Floor	70% Car Parking and 30% Habitation
09	Lime terracing, RCC cornice and parapet	0.92 m height
10	Roof top RCC water tank including beams and supports etc	12,000 Gallons
11	For mosaic work in all rooms including stair, tiles in bathrooms and normal finishing	Tk.980 per square meter
12	Underground water reservoir, distribution line, water pump, pump house, WASA charge	1,35,000 Gallons
13	Boundary wall	RCC frame

(2+2+8+2+4+2+6=26)

3. Mr. Rahim purchased a 15 m wide (front side) and 20 m long plot. The adjacent road is 6 m wide. He wants to construct a three storied residential building (Type A2) on his plot. His Architect wants to prepare a drawing sheet for RAJUK approval. Calculate the followings for the Architect:

   (i) Minimum front set- back as per RAJUK rules?

   (ii) Back and side set- backs as per RAJUK rules?

   (iii) If you keep front, back and side set- backs as per RAJUK minimum setback rules, then what will be the ground coverage of the building? Does it complie with maximum ground coverage as per RAJUK rules, explain? If not, then what will be the back set back (take 0.25 m rounding) if, front setback is 2.5 m and side setback is 2.0 m in each side.

Draw layout plan and find out the plinth area of the building as per RAJUK ground coverage rules?

(iv) What is the Floor Area ratio (FAR) of the building for 60% ground coverage? Does it comply with RAJUK rules, explain? Do not consider ground floor area while calculating total floor area.

(v) What is the available and minimum required parking space? Assume, (a) Generator room 30 sqm (b) Guard room 5 sqm (c) Driver's waiting room 5% of the plinth area (d) stair and lift area (total) 40 sqm (e) Apartment size 180 sqm (gross) and No. of apartment in each floor is 1 (ONE) (f) Drive way 60% area of parking space. (g) 60 % ground coverage.

(vi) Find the maximum number of floor levels that can be constructed. Assume ground floor area is reserved for car parking and other purposes and do not consider ground floor area while calculating total floor area.

(vii) If he wants to construct eight storied building, then what will be the ground coverage? Assume ground floor area is reserved for parking and other purposes and do not consider ground floor area while calculating total floor area.

Table: FAR, Maximum Allowable Land Use and Minimum Width of Adjacent Road (***Source: RAJUK***)

Building Occupancy Type		≤150 Sq. metre			≥ 150 Sq. metre ≤ 300 Sq. metre		
		FAR	Max^{m} Land Use (%)	Min^{m} Road Width (m)	FAR	Max^{m} Land Use (%)	Min^{m} Road Width (m)
Type A : Residential	A1-A4	2.5	65	6	3.0	60	6

Table: PARKING AND TRAFFIC REGULATION STANDARD ***(Source: RAJUK)***

Vehicle Type	Parking width	Parking Length	Area
Car	2.4 m	4.8m	11.52 sqm
Bus & Truck	3.6 m	10.0m	360 sqm

Table: MINIMUM PARKING REQUIREMENTS ***(Source: RAJUK)***

Occupancy Type	Building Type	Minimum Parking Requirements
Residential buildings	**Type A**	
Flats with gross floor area of 180 sqm		1 car parking for each unit

Table: MINIMUM SETBACK

A. FRONT SETBACK:

The minimum setback is the larger value of 4.5 metres from the centre of the road or 1.5 meter from the front property line.

B. FOR SIDE SETBACK UPTO 10 STORIED OR 33.00 m HIGH BUILDING: (Source: RAJUK)

Size of the plot (sqm)	Minimum back setback (m)	Side setback(m)
276 sqm - 1300 sqm	2.00	1.25
1301 and higher	2.00	1.50

Foundation Cost upto PL

Storey	q_a= 2 ksf	q_a= 2 .50ksf	q_a= 3.0 ksf	q_a= 3.5 ksf	q_a= 4.0 ksf	q_a= 4.5 ksf	q_a= 5.0 ksf
1	3982	3875	3811	3769	3740	3718	3702
2	4684	4381	4199	4080	3997	3936	3830
3	5591	5036	4702	4482	4329	4217	4133
4	6566	5811	5296	4958	4723	4551	4421
5	8001	6774	6035	5550	5212	4965	4778
6	9495	7851	6862	6213	5759	5429	5178
7	10961	8908	7673	6862	6296	5883	5571
8		10043	8544	7560	6873	6371	5992
9		11252	9471	8302	7487	6891	6441
10		12529	10451	9088	8136	7441	6915
11			11482	9913	8818	8019	7414
12			12561	10777	9532	8623	7936
13				11679	10277	9254	8480
14				12614	11051	9909	9046
15					11853	10588	9632

Superstructure Cost

Building Category													
		Non-Residential (fc=19-21 MPa, Brick Chips)			Residential (fc=19-21 MPa, Brick Chips)			Non-Residential (fc=22-25 MPa, Stone Chips)			Residential (fc=22-25 MPa, Stone Chips)		
Level	Floor	Economy	Standard	Superior	Economy	Standard	Superior	Economy	Standard	Superior	Economy	Standard	Superior
0	GF Park	5449	5812	6538	5634	6010	6761	5922	6317	7107	6124	6532	7349
0A	Habitation	8545	9601	12674	8837	9929	13106	9020	10135	13378	9631	10792	14274
1	1 st Floor	8242	9360	12224	8523	9576	12640	8699	9776	12903	9289	10409	13767
2	2nd Floor	8365	9399	12407	8651	9720	12830	8830	9921	13096	9568	10565	14180
3	3 rd Floor	8491	9540	12593	8780	9866	13023	8962	10070	13293	9855	10723	14606
4	4 th Floor	8618	9683	12782	8912	10014	13218	9097	10221	13492	10151	10884	15044
5	5 th Floor	8748	9829	12974	9046	10154	13416	9233	10374	13694	10455	11046	15495
6	6 th Floor	8835	9927	13104	9136	10265	13550	9326	10478	13831	11030	11158	15960

ADDITIONAL COST FOR DIFFERENT ITEMS

1. Roof top RCC Parapet		Tk. 953.00/ sqm
2. Roof top RCC water Tank		83.00 / gallon
3. Internal Sanitary and Water Supply		
(i) Residential Building	Economy	Tk. 475 /sqm
	Standard	Tk.712 /sqm
	Superior	Tk. 1068 /sqm
(i) Non-Residential Building	Economy	Tk. 356 /sqm
	Standard	Tk.534 /sqm
	Superior	Tk. 801 /sqm
4. Internal Electrification		
(i) Residential Building	Economy	Tk. 1032 /sqm
	Standard	Tk.1289 /sqm
	Superior	Tk. 1547 /sqm
(i) Non-Residential Building	Economy	Tk. 774 /sqm
	Standard	Tk.967 /sqm
	Superior	Tk. 1161 /sqm
5. Gas Connection	GF	Tk. 256 / sqm
	Other floors	Tk. 102 /sqm
6. External Water Supply		59.00 / gallon
7. Boundary Wall		Tk. 3486 / m

8. 18% cost should be deducted for departmental construction

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B. Sc. Engineering (Civil)

Course Title: Engineering Materials | Course Code: CE 201
Time: 3 Hours | Full Marks: 150

There are EIGHT Questions. Answer **SIX QUESTIONS including Question No. 1 and Question No. 2. QUESTIONS 1 & 2 are COMPULSORY.**

1 Concrete mix design is required for a building construction project in Dhaka. The following basic data for the mix design are available: (40)

Volume ratio of sand to total aggregate = 0.36
Air Content = 2%
Specific gravity of cement = 3.0
Specific gravity of sand (SSD) = 2.65
Specific gravity of coarse aggregate (SSD) = 2.65
Design compressive strength (28 days) = 4000 psi
Minimum required slump = 175 mm
Maximum aggregate size = ¾ inch
Aggregate type = stone chips

The following graphs are provided :

- Variation of compressive strength (28 days) with W/C.
- Variation of cement content with compressive strength (28 days) for different aggregate size and slump value

(i) Design a concrete mix.
(ii) Calculate the volume ratio of the mix (assume unit weights of cement, sand (dry), and coarse aggregate (dry) with void are 1300 kg/m^3, 1200 kg/m^3 and 1400 kg/m^3, respectively). Assume absorption capacity of 1.5% for both the coarse aggregate and fine aggregate.
(iii) Calculate the cost of concrete per cubic meter. Assume the cost of 1 bag cement = Tk. 360, cost of 1 cft SSD sand = Tk. 35, and cost of 1 cft SSD stone chips = Tk. 110.
(iv) Estimate the materials in weight and volume (cement, water, sand, and coarse aggregate) required to cast a slab of 40 ft by 60 ft with thickness 6 inch.
(v) Assume 4% of surplus water in sand over SSD condition and the amount of bulking of sand = 10%. What adjustments are necessary in the volumetric and weight based mix designs?
(vi) Calculate the compaction factor of the mix.

2 For a bridge construction project, the recommended FM for sand is 2.6. From a nearby market, two sand samples (Sand 1 and Sand 2) were collected. The samples were sent to the Concrete Laboratory of The University of Asia Pacific (UAP) for sieve analysis. The sieve analysis data are given below: (22)

ASTM Sieve	Amount Retained (g)	
	Sand 1	Sand 2
3 inch	0	0
1.5 inch	0	0
1.0 inch	0	0
¾ inch	0	0
½ inch	0	0
3/8 inch	0	0
#4	0	0
#8	80	0
#12	90	70
#16	100	70
#30	70	70
#40	70	70
#50	0	35
#100	0	35
#200	45	100
Pan	45	50

(i) Calculate FM of the sand samples.
(ii) Draw the grading curve of the sand samples.
(iii) In what proportion, the sand samples are to be mixed to get the recommended FM?
(iv) Comment on the samples based on the sieve analysis data and grading curves.

3 (a) Draw typical stress-strain curve of concrete and steel. Explain the salient features of the curves. (5)

(b) Discuss the problems associated with high strength concrete and high-strength steel. (3)

(c) Define the following mechanical properties of a material: (5)
(i) Creep
(ii) Relaxation
(iii) Malleability
(iv) Ductility
(v) Fatigue strength

(d) Discuss the effect of excess lime in brick earth. (2)

(e) Explain the strength development process of brick during burning. (2)

(f) Why is drying of bricks necessary before burning? (2)

(g) Write the field tests of bricks. (3)

4 (a) Compare fly ash cement and ordinary portland cement. (5)

(b) What do you mean by hydration of cement? Write the hydration reactions of cement. Explain the morphology of cement hydration products. (6)

(c) "Fly ash is a pozzolanic material but slag is a hydraulic material"- Explain. (2)

(d) Define normal consistency, initial setting time, and final setting time of cement. (3)

(e) Write the main steps of cement manufacturing process. (3)

(f) Explain the role of cement industries in global warming. (3)

5 (a) Explain corrosion of steel bars in concrete with chemical reactions. (5)

(b) Assume that you are in-charge of a construction project. During several site visits to the project site, you observed the following: (10)

(i) Footing 1 – reinforcement is placed at the bottom with a clear cover of 5 mm.

(ii) Beam 1 – Concrete was poured in two layers (top and bottom) with 30 minutes interval.

(iii) Beam 2 – A construction joint is made at the mid span of the beam

(iv) Column 1 – A lot of voids was found in concrete after removal of formwork.

(v) Column 2 – Without removing laitance over the hardened concrete, a new concrete was placed.

(vi) Column 3 – A lot of rust was found over the reinforcement before casting concrete.

(vii) Column 4 – Concrete casting was made without vibrator.

(viii) Slab 1 – A lot of bleeding water was found on the surface of the slab after casting concrete.

(ix) Slab 2 - Concrete casting of the slab was completed in the early morning of a summer season. Curing of concrete started after 24 hours.

(x) Cement bags were stored outside without any cover.

Make comments on the above-mentioned observations keeping in mind the quality of construction works.

(c) "Permeability of concrete is a key factor related to durability of concrete" – Explain. (2)

(d) "Rich concrete is susceptible to autogeneous shrinkage" – Explain. (2)

(e) What changes in cement clinker are necessary to make the following cements: (3)

(i) High early strength cement

(ii) Low heat cement

(iii) Sulfate resistant cement

6 (a) Explain briefly the influence of the following factors to the compressive strength of concrete: (10)

(i) W/C

(ii) FM of sand

(iii) Curing

(iv) Temperature

(v) Sand-to-aggregate volume ratio

(vi) Grading of coarse aggregate

(vii) Cement content

(viii) Fineness of cement

(ix) Compaction of concrete
(x) Mineral admixture

(b) Explain the role of super plasticizer in making high strength concrete. (3)

(c) Write short notes on the following: (9)

(i) Cold joint
(ii) Honeycomb
(iii) Laitance
(iv) Bleeding
(v) Segregation
(vi) Advantages and disadvantages of ready mix concrete
(vii) Ferrocement
(viii) Air entraining admixture
(ix) Maturity of concrete

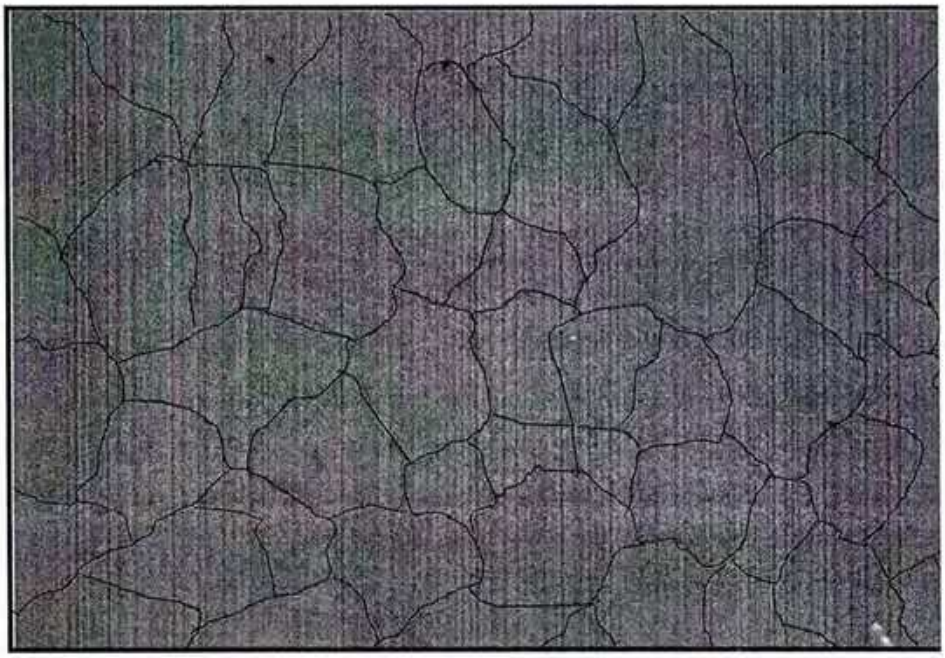
7 (a) Refer to the following data associated with a sand sample: (5)

Volume of the Sample = 1 m^3
Weight of the OD Sample = 1400 kg
Bulk Specific Gravity (OD Basis) = 2.6
Absorption Capacity = 15%
Calculate the following:

(i) Amount of void in the sample
(ii) SSD weight of the sample.

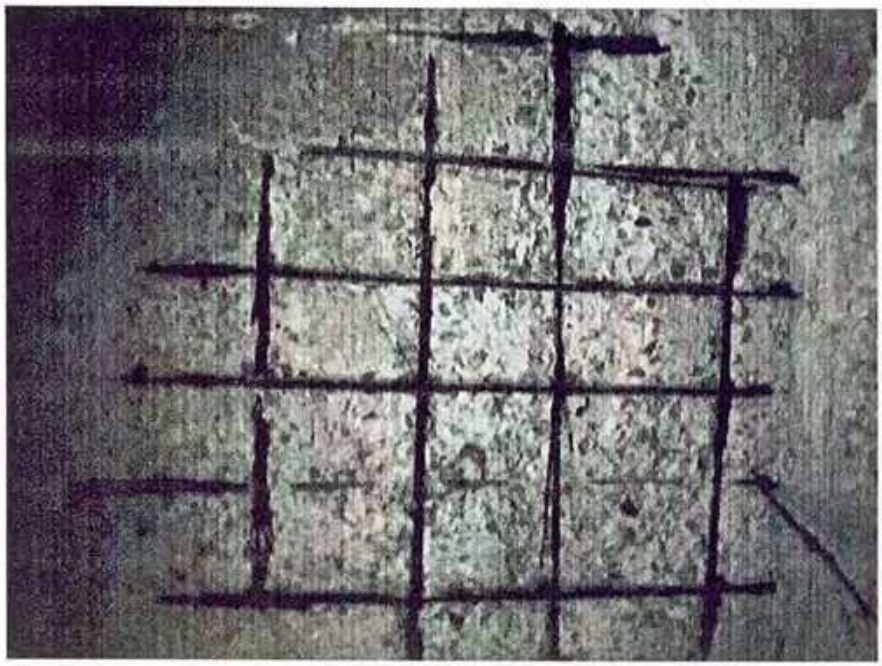
(b) Explain sea water attack of concrete (due to chloride, carbon dioxide, and sulfate) with chemical reactions. (7)

(c) Refer to the following photograph taken from a brick wall surface with mortar. Briefly explain the causes related to these cracks. (5)



Photograph – Mortar Surface (Lines represent crack)

(d) Refer to the following photograph taken from a building in Dhaka city. Briefly explain the causes of deterioration of the slab. (5)



Photograph : Bottom surface of a slab

8 (a) Explain three defects of timber. (2)

(b) Discuss the uses of rubber in civil engineering projects. (3)

(c) Explain the process of formation of annual rings in trees. (3)

(d) Write short notes on the following: (14)

(i) Vulcanization
(ii) Importance of seasoning of timber
(iii) Hexagonal closed packed unit cell
(iv) Crystal and amorphous structures
(v) Atomic packing factor for the face centered cubic unit cell
(vi) Ingredients of paint
(vii) FRP

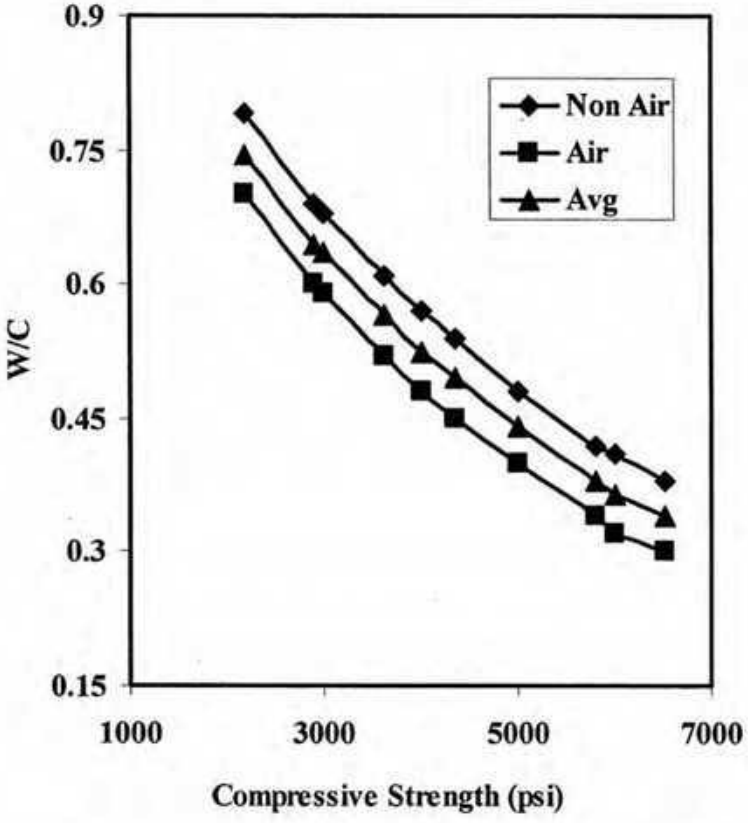


Fig. W/C versus Compressive Strength (aggregate type = stone chips)

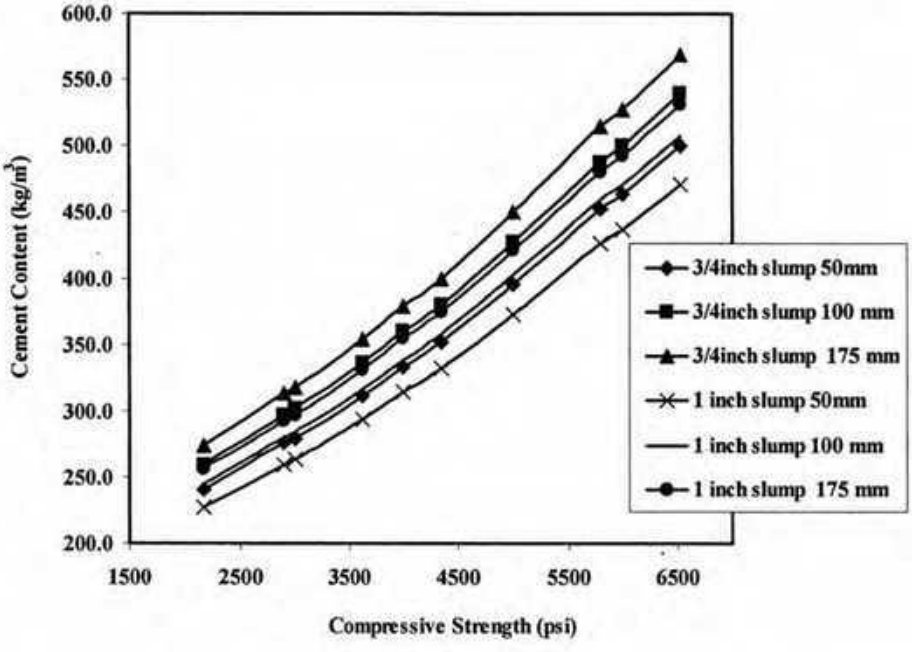


Fig. Cement Content versus Compressive Strength (aggregate type = stone chips)

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B. Sc. Engineering (Civil)

Course Title: Numerical Analysis & Computer Programming | Course Code: CE 205

Time: 3 hours | Credit Hours: 3.0 | Full Marks: 90 (60+30)

[There are two sections **SECTION A** and **SECTION B.** Answer both the sections and **Q.9 is compulsory]**

SECTION A (Numerical Analysis)

[Answer **any 6 (Six)** of the following 8 questions]

1. Fit the curve $V_i = A h_i + B h_i^2 + C h_i^3$ to the following set of points. 10

h_i	0.1	0.2	0.4	0.5
V_i	21	11	7	6

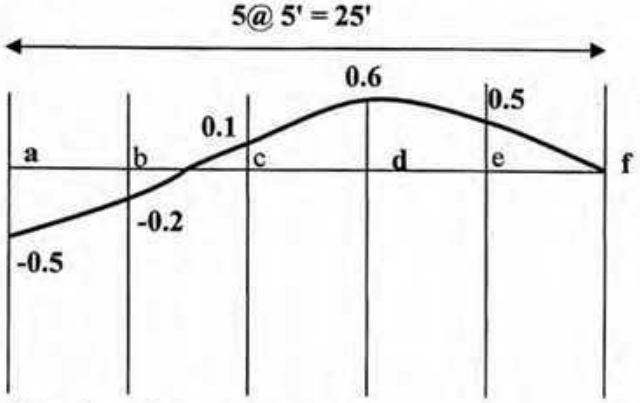
Find the value of V corresponding to h = 0.45, from the fitted curve.

2. For the following data, 10

x	3.141	3.142	3.143	3.144
y	0.497068	0.497206	0.497344	0.497482

(i) Derive the Gregory Newton Interpolation polynomial.
(ii) Calculate the value of y at **x = 3.141692**.

3. Experimentally observed values of deflections of a beam are shown in the following figure. 10



All deflections of the above figure are in inch.
Using the Difference Table for point **a, d** and **f** to calculate :
(i) The bending moment. [$M = -EID^2y$]
(ii) The shear force [$V = -EI D^3y$]
(iii) The slope. [$\theta = dy/dx$]
[Given; E = 30,000 ksi, I = 3500 in^4]

4. Use Gauss Elimination method to solve the following system of equations: 10

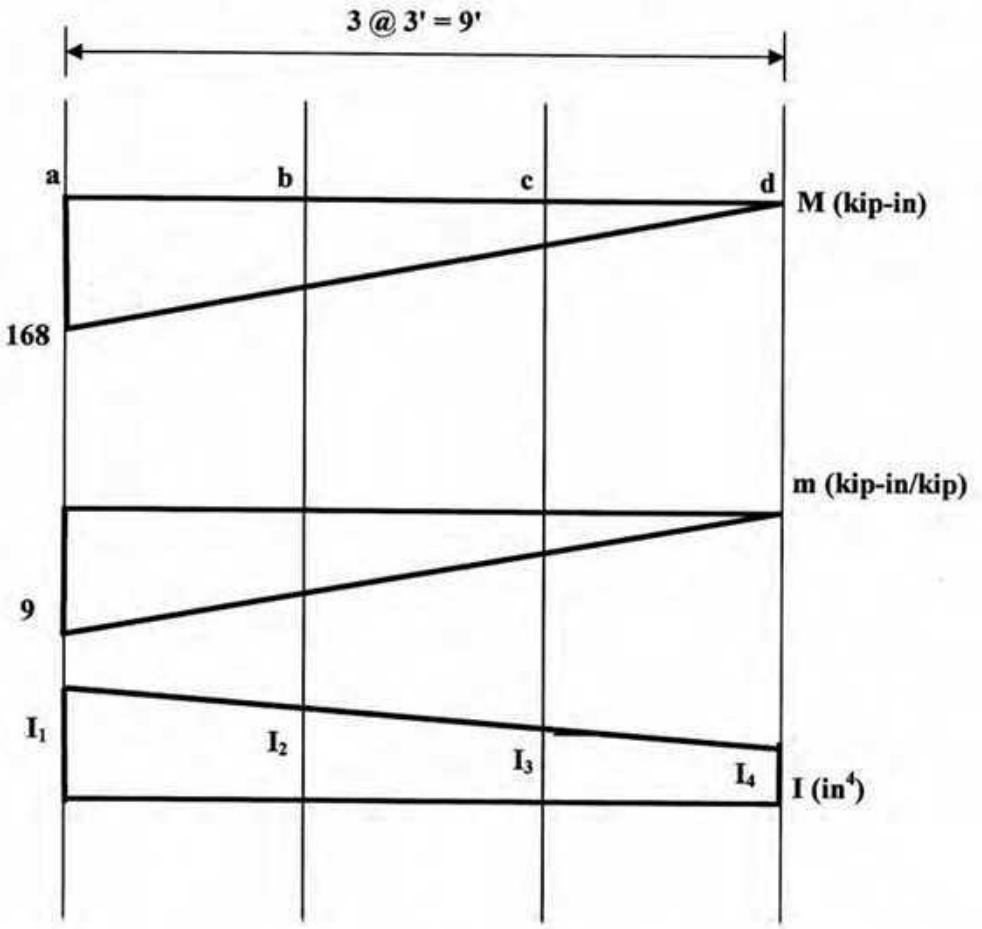
$$2u + 5v + 8w = 36$$
$$4u + 7v - 12w = -16$$
$$u + 8v + w = 20$$

5. Using the given data, 10

x	1	2	5	8
y	0	0.69315	1.60944	2.07944

i. Derive a unique polynomial using Lagrangian Polynomial formula.
ii. Calculate the value y at x = 3.

6. The following diagrams show the variation of Bending Moments M and m and Moment of Inertia I in a beam. Estimate I_1. 10
[Given; Deflection of the beam, $\int (Mm / EI)\, dx = 0.014$ in, I_1: I_4 = 4:1, E = 29000 ksi.]



7. (i) Using Regula Falsi method, find a real root of the following equation: 10
$f(x) = x + \cos x$, desired accuracy = 0.001, start at x = -1
(ii) Using Simpson's rule, determine $f(x) = \int_{-2}^{6} (x + \sin 2x)\, dx$ using eight (8) equal subdivisions.

8. (i) Using Newton Raphson method, find a real root of the following equation: 10
$f(x) = e^{-x} - \cos(\pi x/4)$, desired accuracy = 0.0001, start at x= 1
(ii) Determine the value of the integral $f(x) = \int_{-1}^{3} (\sqrt[3]{4x^4})\, dx$, using Trapezium Rule taking eight (8) equal subdivisions.

SECTION B (Computer Programming)

[Answer **any 2 (Two)** of the following 3 questions. **Q.9** is compulsory.]

9. Read the following program carefully and answer the questions below: 15

```
#include<iostream>
using namespace std;
int reg_no (int A[25]);
int CT_marks(int A[25],int C[3][25]);
void main()
{
        cout<<"This program can store registration number and class test marks"<<endl;
        int A[25];
        int C[3][25];
        reg_no(A);
        CT_marks(A,C);
        cout<< "This program terminates here" << endl;
}
int reg_no(int A[25])
{
        cout<< "Write down student registration number sequentially" <<endl;
        for(int i=0; i<25; i++)
        {cin >> A[i];}
        return 0;
}
int CT_marks(int A[25],int C[3][25])
{
        for(int i=0; i<25; i++)
{
                cout<<"CT marks of student no="<<A[i]<<endl;
                cin>> C[0][i]>> C[1][i]>> C[2][i];
}
return 0;
}
```

(a) Write the number of
   i. variable ii. function iii. return statement iv. bytes of memory stored
   in the above program.

(b) Write down the key words used in the program.

(c) What is the purpose of the program and what other purposes that can be served using this program?

(d) Suppose you want to add the marks of all 3 class tests and show them on screen. What and where modifications should be done?

(e) Suppose you wish to rebuild the program and want to add another function named *best_2*. This new function can identify best two class test out of three. Now rewrite the program with required features.

10. (a) Define variable, declaration of variable, definition of variable. Write examples of basic data type. 15

(b) What are the assignment operators? "= operator is ***right associative***" describe the sentence.

(c) Write a program that can calculate the sum of the series 1+3+5+7+..... up to n^{th} term.

11 (a) What is local and global variable? Provide an example to describe it. 15

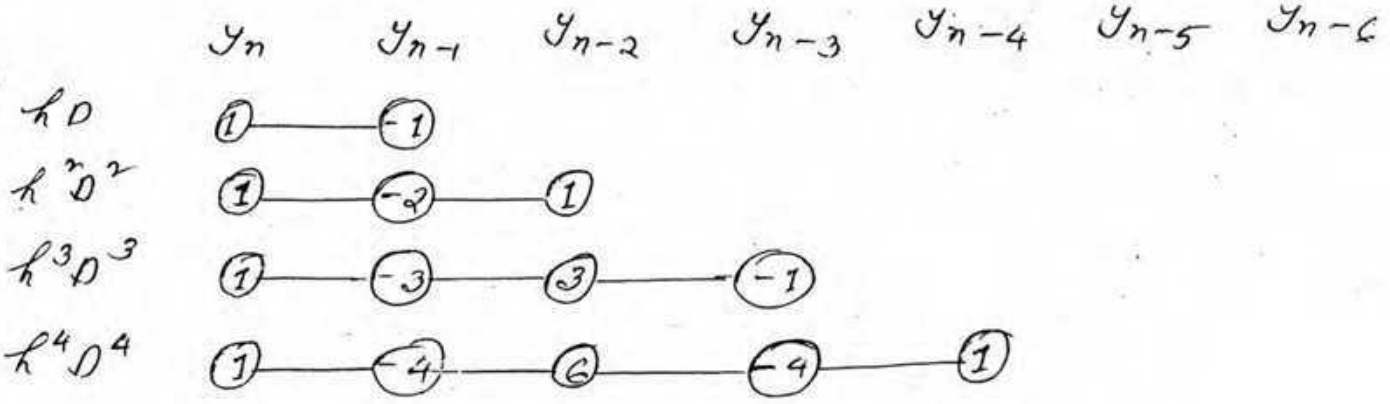
(b) Write a program to show the use of various logical operators.

(c) Write a program that uses *for* loop to show shear force and bending moment after every 0.5 ft of a simply supported 10 ft span beam with 1 kip/ft UDL.

[Given; $V(x) = w*(L/2 - x)$ and $M(x) = w*(Lx-x^2)/2$]

Mathematical Models of three methods :—

(a) Backward difference (∇) :—



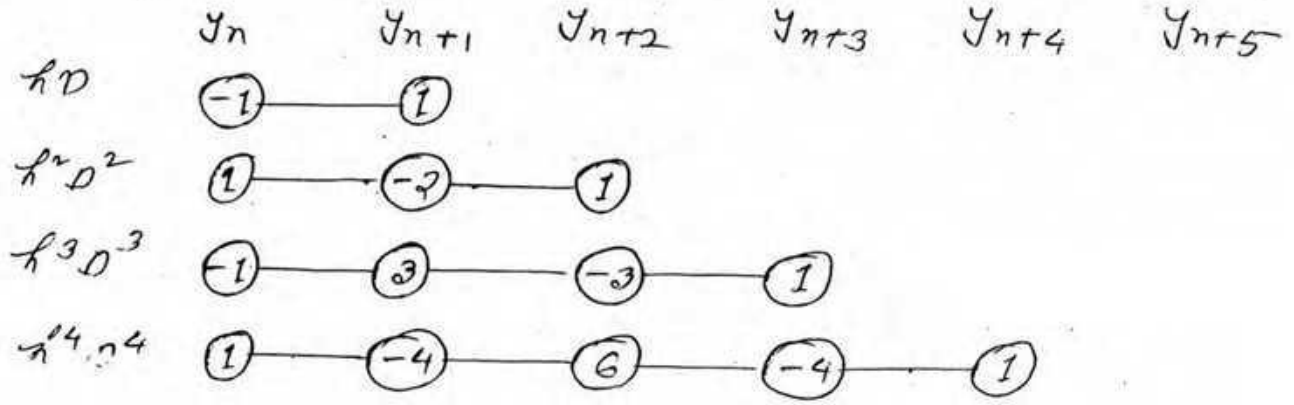
$\therefore h\nabla = y_n - y_{n-1}$

$h^2\nabla^2 = y_n - 2y_{n-1} + y_{n-2}$

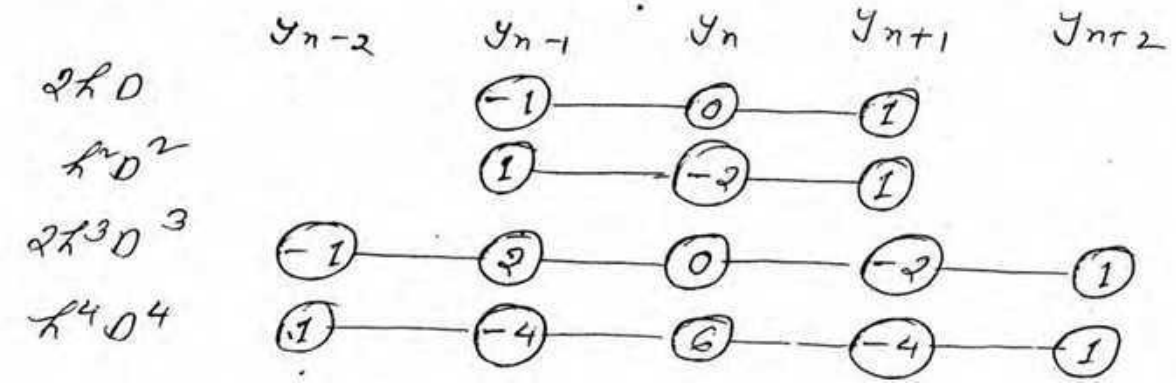
$h^3\nabla^3 = y_n - 3y_{n-1} + 3y_{n-2} - y_{n-3}$

$h^4\nabla^4 = y_n - 4y_{n-1} + 6y_{n-2} - 4y_{n-3} + y_{n-4}$

(b) Forward Difference (Δ)



(c) Central difference (δ)

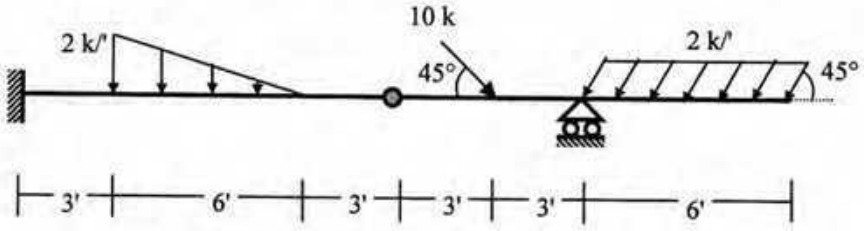


The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010 (Set A1)
Program: B. Sc. Engineering (Civil)

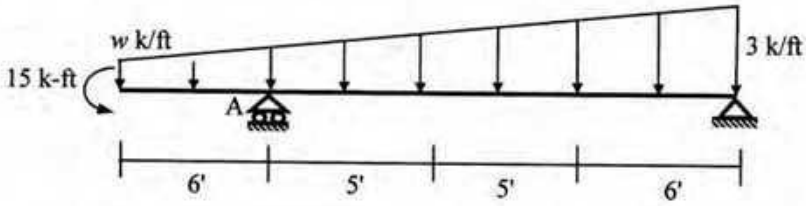
Course Title: Mechanics of Solids I | Credit Hours: 3.0 | Course Code: CE 211
Time: 3 hours | Full Marks: 100 (= 10 × 10)

[Answer **any 10 (ten)** of the following 14 questions]

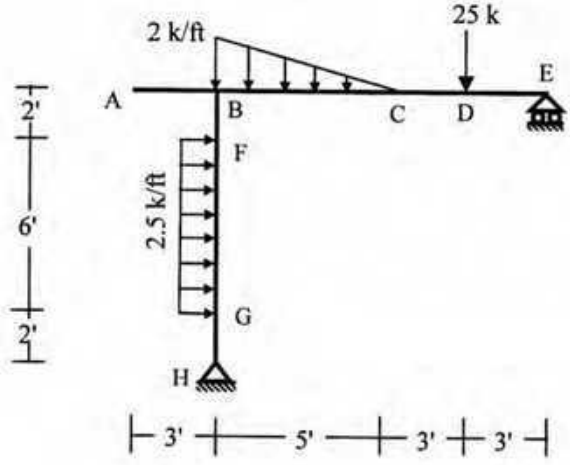
1. Draw the axial force, shear force and bending moment diagram of the following beam.



2. For the beam *abcdef* loaded as shown in the figure below
   (i) Derive equations for shear force and bending moment in terms of *w*, using Singularity Functions.
   (ii) Calculate the value of *w* necessary to make the reaction at support A equal to 27.1 k.



3. Draw the shear force and bending moment diagram for the frame shown below



4. A rectangular plate is designed to be connected by welds (3.5″-long and 3/8-inch thick) in opposite sides as shown in the Fig-a below. If the connection is then replaced by 5 bolts arranged as shown in Fig-b (to carry the same design force), calculate the required (i) diameter of each bolt, (ii) thickness of the plate and (iii) tearing stresses in the plate.
[Given: Maximum allowable stresses in shear = 16 ksi (both weld and bolt) and bearing = 20 ksi].

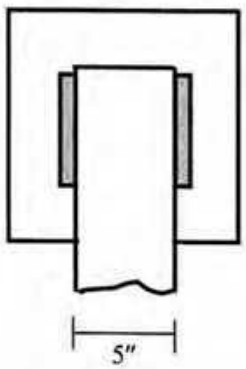


Fig-a (Welded Connection)

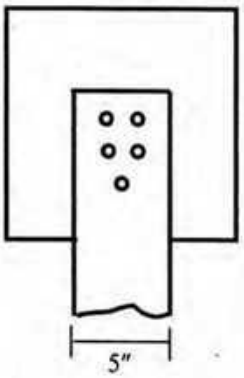
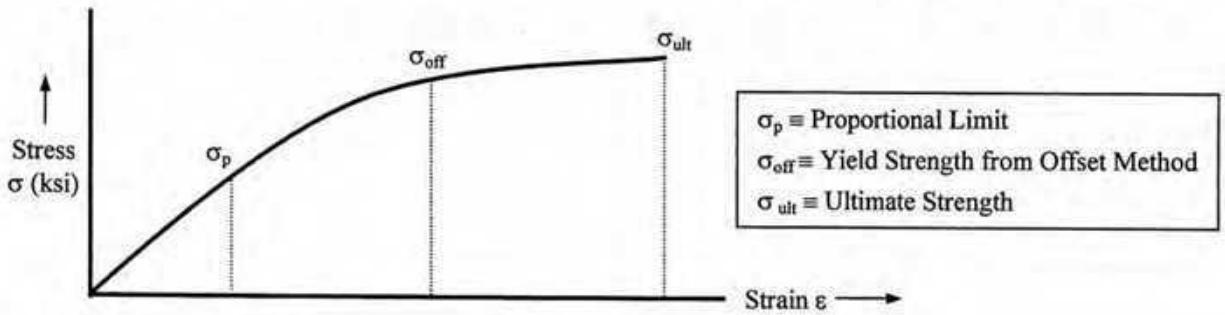
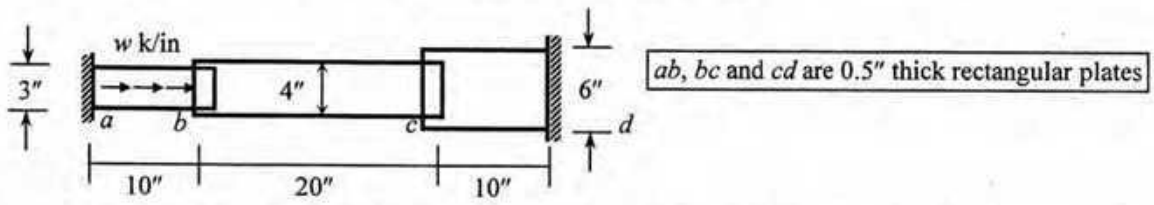


Fig-b (Bolted Connection)

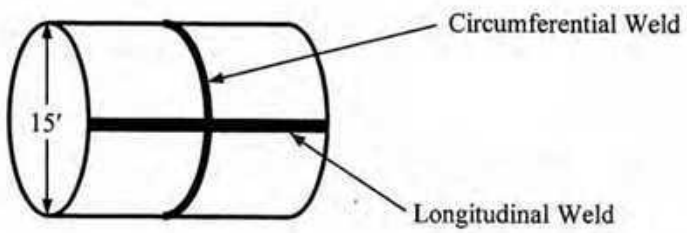
5. The figure below shows an idealized stress-strain diagram for the compression test of a timber specimen of (2″× 2″) area and 6″ length.
If its modulus of resilience = 4 psi, $\varepsilon_1 = 0.20\%$, $\varepsilon_2 = 0.50\%$, $\varepsilon_3 = 0.80\%$, calculate the
(i) Modulus of Elasticity, (ii) σ_p, (iii) σ_{off}, (iv) Proof Strength, (v) Final length of the specimen.



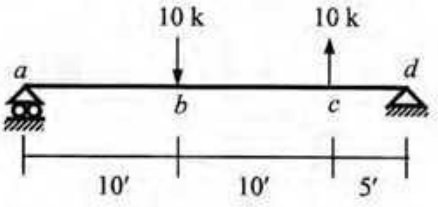
6. For the axially loaded structure *abcd* shown below
(i) Draw the AFD,
(ii) Calculate the maximum allowable value of *w* [considering axial stresses in *ab*, *bc* and *cd*].
[Given: Allowable stress in tension = 30 ksi, compression = 20 ksi].

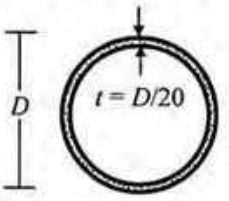


7. Figure below shows a cylinder of 15′-diameter subjected to internal pressure of 15 psi. Calculate the
(i) required wall thickness of the cylinder
(ii) corresponding tangential and longitudinal stresses and strains in the wall
(iii) required thickness of the longitudinal and circumferential welds to resist the wall stresses
[Given: Allowable tensile stress in the wall = 30 ksi, Allowable shear stress in welds = 20 ksi, Modulus of elasticity of steel = 29000 ksi, Poisson's ratio = 0.30].



8. For the beam *abcd* loaded as shown below, the allowable tensile and compressive bending stresses in the cross-section are 30 ksi and 20 ksi respectively.
   (i) Calculate the required diameter (D) and thickness (t) of the beam cross-section.
   (ii) Draw the bending stress diagram over the cross-section for the values of D and t calculated in (i).

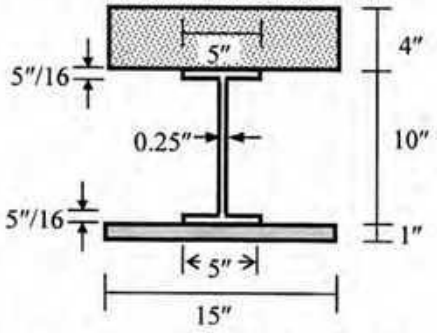


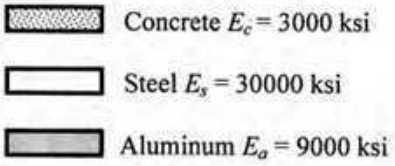


Cross-section of the beam

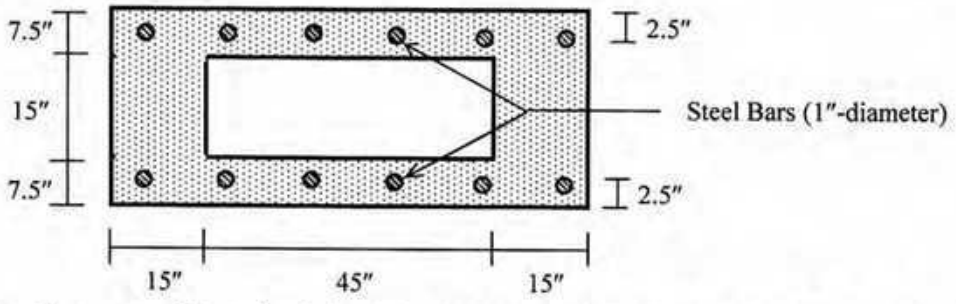
9. Calculate the required diameter (D) and thickness (t) of the beam cross-section shown in Question 8 to make its plastic moment (M_p) equal to 50 k-ft [Given: Yield Strength σ_{yp} = 60 ksi].

10. For the beam shown in Question 8, draw the flexural strain diagram over the composite cross-sectional area (shown below) at section *c*.
    Also calculate the maximum flexural stresses in concrete, steel and aluminum.

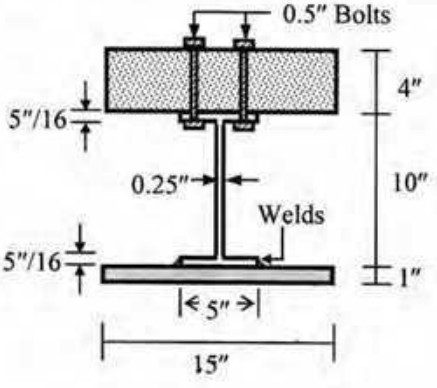


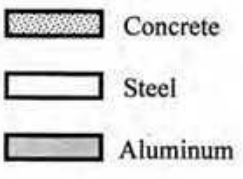


11. Calculate the maximum allowable bending moment for the Reinforced Concrete section shown below assuming the section to be (i) uncracked, (ii) cracked due to concrete tension
    [Given: E_{steel} = 30000 ksi, $E_{concrete}$ = 3000 ksi, allowable tensile stress in steel = 24 ksi, allowable compressive stress in concrete = 2.0 ksi, allowable tensile stress in concrete = 0.3 ksi].



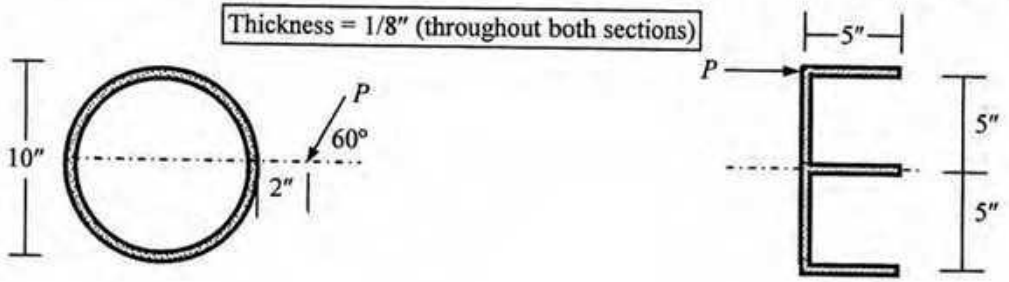
12. The figure below shows a steel I-section being bolted to a 4″ thick concrete slab at the top and welded to a 1″ thick aluminum plate at the bottom. If the section is subjected to the loading shown in Question 8, calculate the required (i) longitudinal spacing of the 0.5″-diameter bolts, (ii) thickness of the welds to resist the maximum shear force in the section [Given: allowable shear stress = 20 ksi].





13. For the beam *abcd* loaded as shown in Question 8, the allowable flexural shear stress is 100 psi.
    (i) Calculate the required diameter (D) and thickness (t) of the beam cross-section.
    (ii) Draw the flexural shear stress diagram over the section for the values of D and t calculated in (i).

14. The cross-sectional areas of two beams are shown below by centerline dimensions. If the self-weight of each beam is 50 lb, calculate the magnitude of force P needed to avoid torsion in the section.

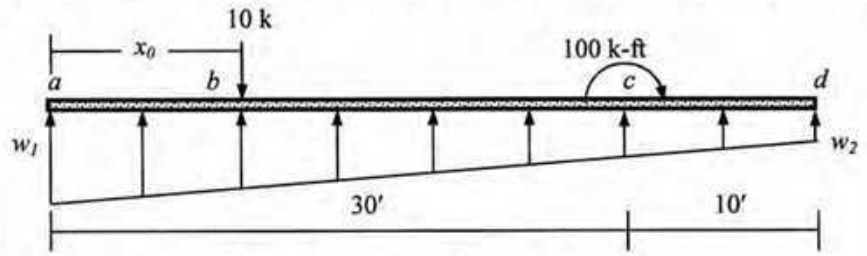


The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010 (Set B1)
Program: B. Sc. Engineering (Civil)

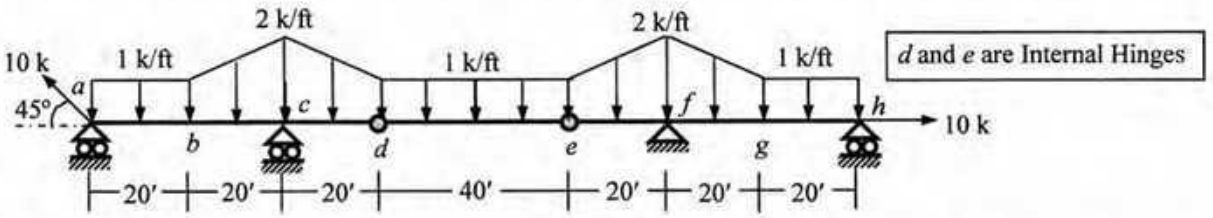
Course Title: Mechanics of Solids I | Credit Hours: 3.0 | Course Code: CE 211
Time: 3 hours | Full Marks: 90 (= 9 × 10)

[Answer **any 9 (nine)** of the following 13 questions]

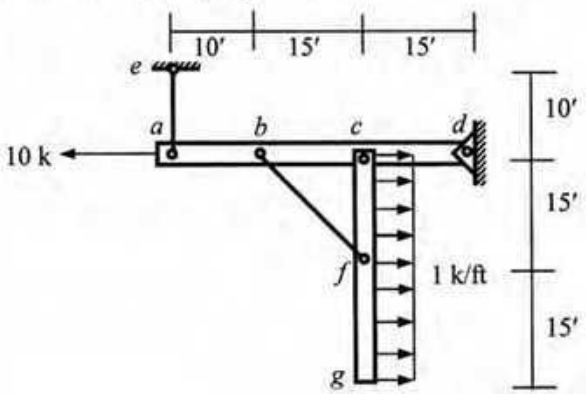
1. Beam *abcd* shown below represents a boat which will turn over if either w_1 or w_2 becomes zero. Use the Singularity Functions to calculate the
   (i) maximum and minimum value of x_0 required to prevent the boat from turning over,
   (ii) corresponding shear force just at the left of *b* and bending moment just at the right of *c*.



2. Draw the AFD, SFD and BMD of the beam *abcdefgh* loaded as shown below.

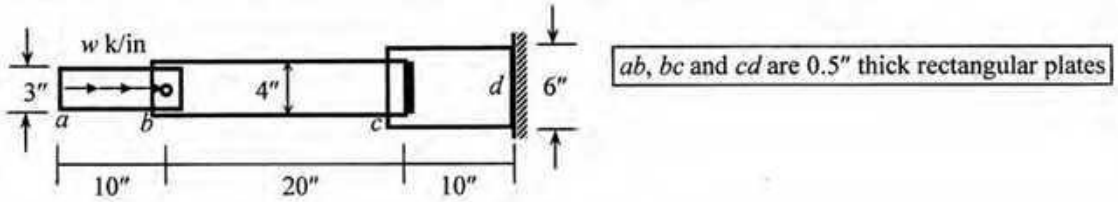


3. Draw the AFD, SFD and BMD of the member *cfg* in the frame structure loaded as shown below [Given: *a*, *b*, *c*, *d* and *f* are pin joints].

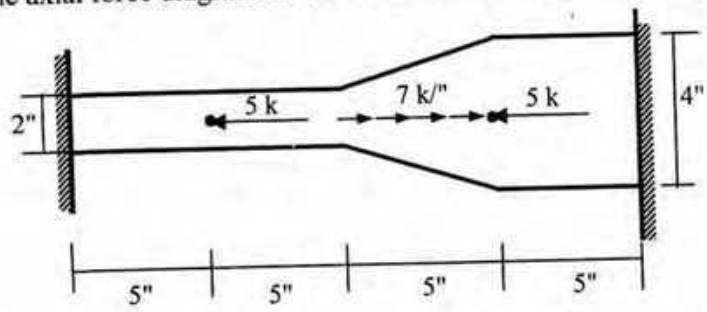


4. (i) Calculate the maximum allowable value of *w* for the axially loaded structure *abc* shown below [considering axial stresses in members *ab*, *bc* and *cd*].
   (ii) For the force *w* calculated in (i), determine the required
   - diameter of the bolt connecting members *ab* and *bc* at joint *b*
   - length of the 3/8″ weld connecting members *bc* and *cd* at joint *c*

   [Given: Allowable stress in shear = 25 ksi, tension = 30 ksi, compression = 20 ksi].

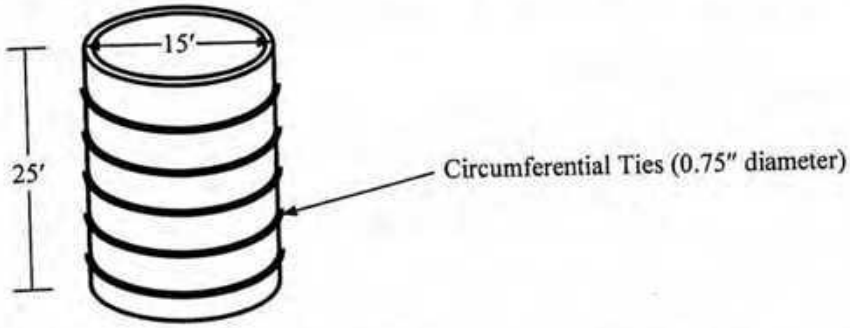


5. Draw the axial force diagram for the member shown below [Given: E = 30,000 ksi, thickness=1"]

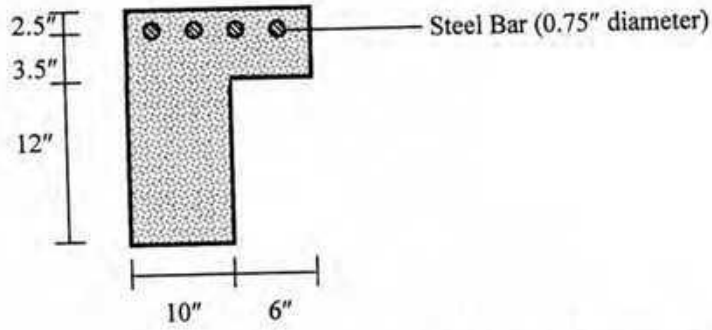


6. The figure below shows a concrete cylinder of 15′ diameter and 25′ height containing water. The cylinder also has circumferential steel ties (diameter = 0.75″) to resist hoop tension. Calculate the
   (i) wall thickness required to resist the tensile stresses in the wall (ignoring the steel ties)
   (ii) corresponding longitudinal and circumferential stresses and strains in the concrete wall
   (iii) required spacing of steel ties to resist hoop stress

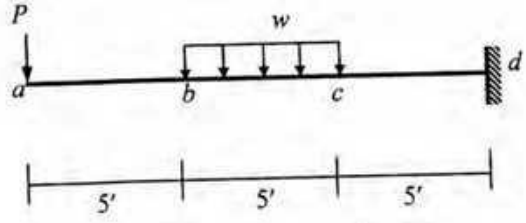
   [Given: Allowable tensile stress in the concrete wall = 300 psi, and in steel ties = 20 ksi, Modulus of Elasticity of concrete = 4000 ksi, Poisson's ratio = 0.30].

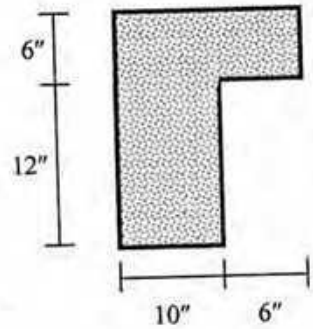


7. For the Reinforced Concrete section shown below
   (i) calculate the maximum allowable bending moment if n = 10, allowable compressive stress in concrete = 2.0 ksi and allowable tensile stress in steel = 20 ksi [assume the section is 'cracked']
   (ii) draw the bending stress diagram over the section for the bending moment calculated in (i).



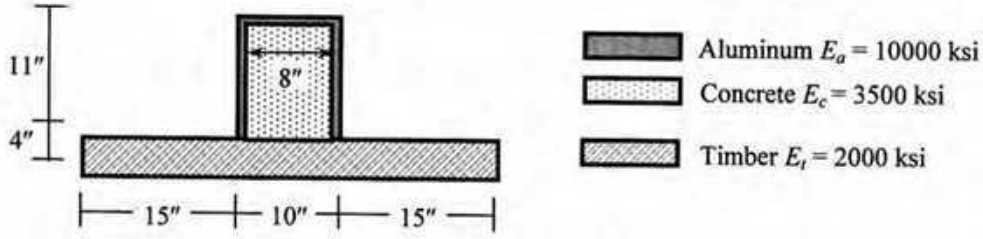
8. For the beam *abcd* loaded as shown below, P = 0 and the allowable tensile and compressive bending stresses in the cross-section are 3 ksi and 2.5 ksi respectively.
   (i) Calculate the maximum allowable value of the distributed load w.
   (ii) Draw the bending stress diagram over the cross-section for the value of w calculated in (i).



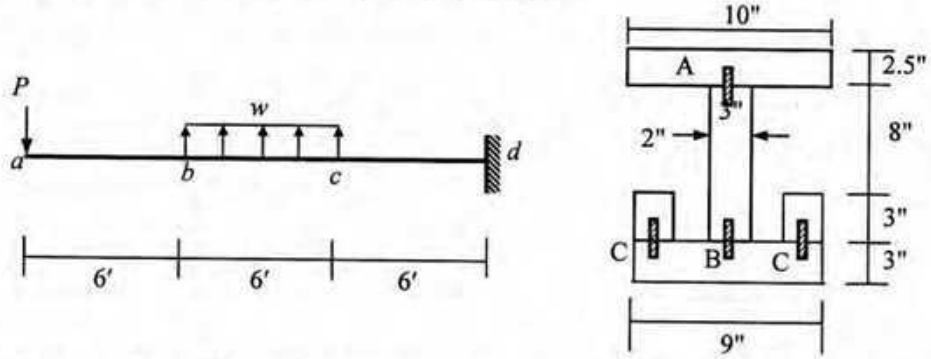


9. Calculate the plastic moment (M_p) and plastic section modulus (Z) of the section shown in Question 8 [Given: Yield Strength $\sigma_{yp} = 4$ ksi]

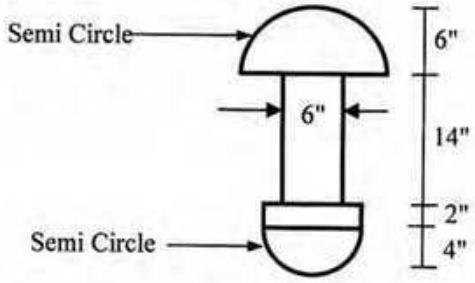
10. For the beam shown in Question 8, draw the flexural strain diagram over the composite cross-sectional area (shown below) at section c, if $P = 20$ kips, $w = 0$.
Also calculate the maximum flexural stresses in concrete, timber and aluminum.



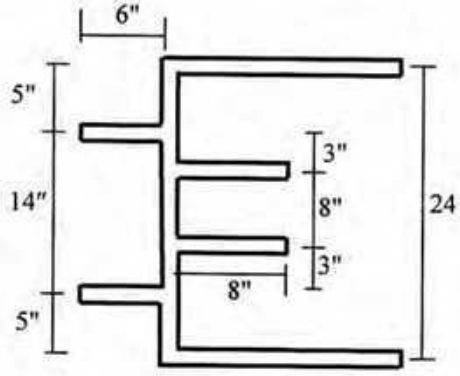
11. For the beam *abcd* loaded as shown below, if $P = 9$ k, and $w = 2.0$ k/ft, for the shear at point c find the necessary spacing of the nails (A, B and C) to hold the planks with the web.
[Given: Allowable shearing force per nail is 3 kips].



12. Show the variation of flexural shear stress over the section shown below for any value of shear V.



13. Determine the location of shear center of the cross-section shown below
[Given: Thickness is 0.1" throughout the section].

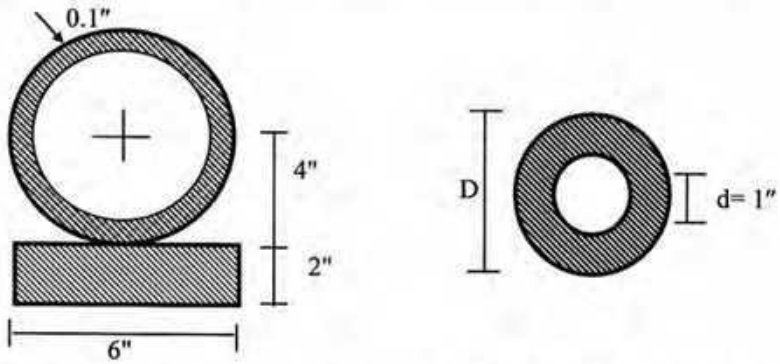


The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010 (Set A1)
Program: B. Sc. Engineering (Civil)

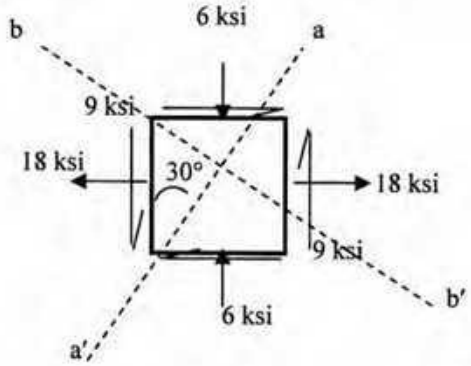
Course Title: Mechanics of Solids II | Credit Hours: 3.0 | Course Code: CE 213
Time: 3 hours | Full Marks: 100 (= 10 × 10)

[Answer **any 10 (ten)** of the following 14 questions]

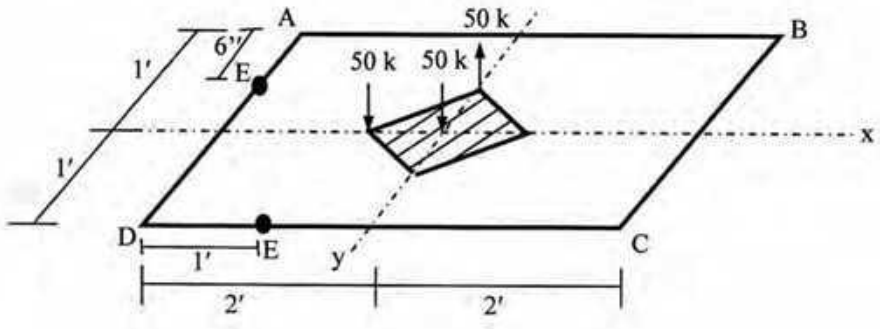
1. Calculate the maximum shear stress and angle of twist per unit length in the compound section shown in the figure below when subjected to a torque of 15 k-ft [G = 12000 ksi].
   Also calculate the diameter (D) of the hollow circular section that has the same maximum shear stress when subjected to the same torque.



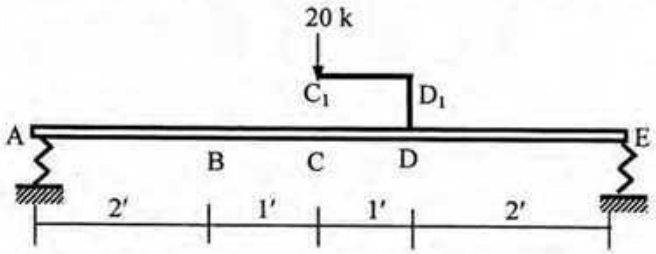
2. Use the Mohr's circle or stress transformation to calculate the normal stress and shear stress on the plane a-a'and plane b-b' shown in the element below. Line a-a' and b-b' are perpendicular to each other. Calculate the magnitude and direction of maximum and minimum normal stress.



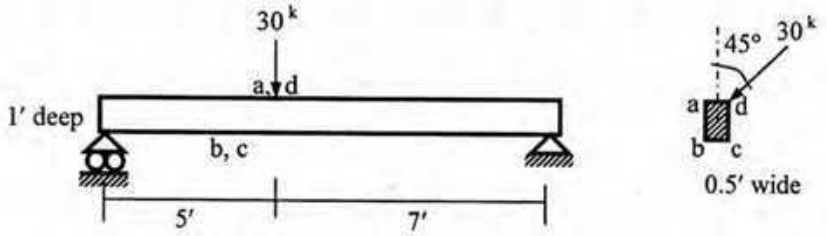
3. The shaded area below represents the kern of the rectangular footing ABCD. For the given loads calculate the normal stresses at E, F and locate the neutral axis.



4. In the figure shown below, member DD_1, C_1D_1, and ABCDE are rigid members. The helical springs at A and E have coil diameter = 1 in, average spring radius = 4 in, number of coils = 6 and shear modulus = 12000 ksi.
Calculate the deflections at A, B, D and the combined shear stress for the spring at E.

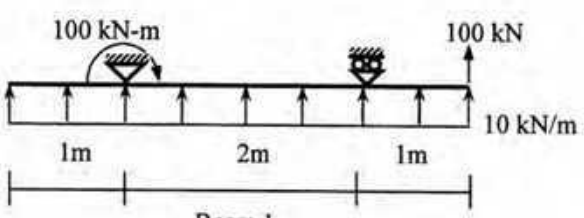


5. Calculate the maximum compound normal stress in the beam shown below (subjected to inclined loading) and show the point/points where it occurs [The beam area is a 0.5′× 1′ rectangle].

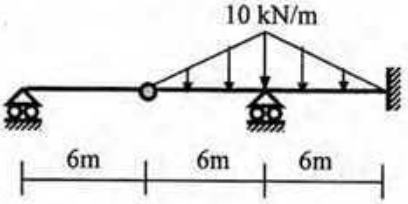


Side Elevation Cross-section

6. For the beams (Beam 1 and Beam 2) shown in the figures below
(i) Write down the expressions for loading function *w(x)* using singularity functions.
(ii) Write down the corresponding boundary conditions.
(iii) Determine whether the beams are statically determinate or indeterminate.
(iv) Draw the qualitative deflected shapes of the beams under the given loads.

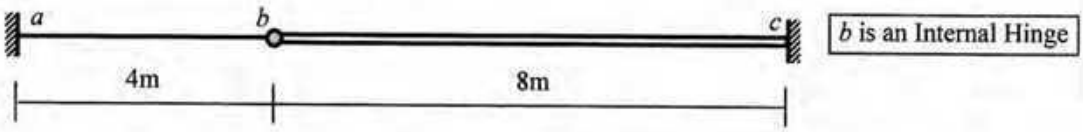


Beam 1

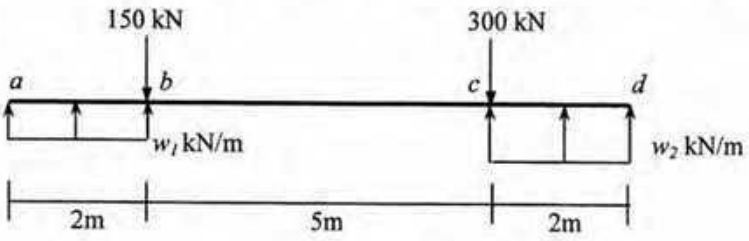


Beam 2

7. In the statically indeterminate beam *abc* shown below, if support *a* deflects 0.010-m downward
(i) calculate the bending moment at support *b*,
(ii) draw the SFD and BMD of the beam [Given: $EI_{bc} = 2EI_{ab} = 80 \times 10^3$ kN-m^2].



8. For the beam shown below, use the Moment-Area Theorems to calculate the vertical deflection at *a* and *d* if deflection at both *b* and *c* is zero [Given: *EI* = constant = 80×10^3 kN-m^2].

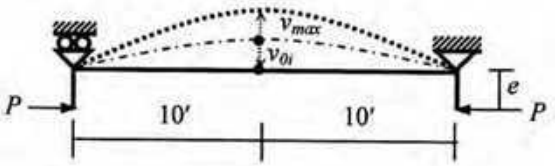


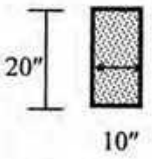
Deflection $v_b = 0$ Deflection $v_c = 0$

9. Answer Question 8 using the Conjugate Beam Method.

10. Answer Question 8 using the Singularity Functions.

11. The figure below shows an initially imperfect simply supported beam [with $v(x) = v_{0i}\ sin(\pi x/L)$] subjected to eccentric compressive force P. If $v_{0i} = 0.05'$, $E = 4000$ ksi, $P = 300$ kips, calculate the
    (i) deflection v_{max} and bending moment M_{max} at the beam midspan if $e = 0.10'$
    (ii) value of e required to make $v_{max} = 0$.

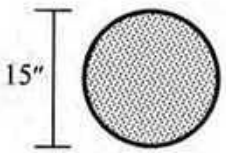




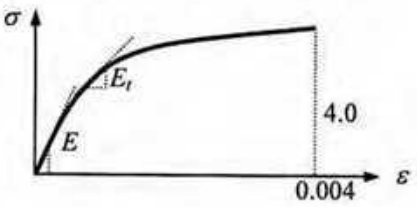
Member Section

12. A cantilever column (of length $L = 12'$, diameter $d = 15''$) is made of a material whose compressive stress-strain (σ-ε) relationship is given by the equation $\sigma = 8/(1 + 0.004/\varepsilon)$ ksi.

    Calculate the critical strain, stress and load for the column.

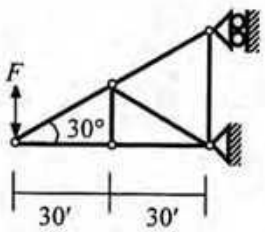


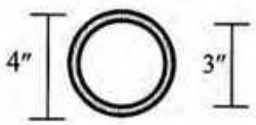
Member Section



Stress-Strain relationship of material

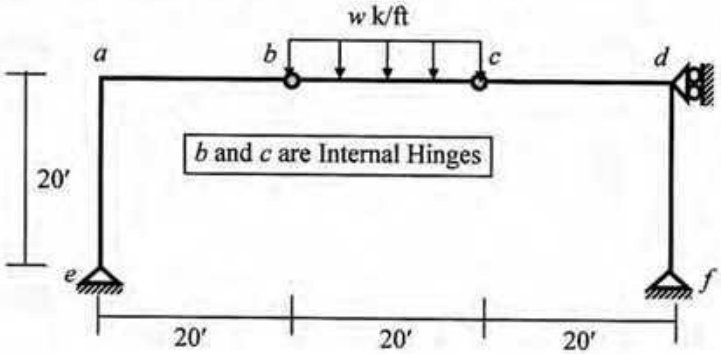
13. Use the AISC-ASD criteria to calculate the allowable value of F to avoid buckling of any member in the truss shown below if F acts (i) downward, (ii) upward [Given: $E = 29000$ ksi, $f_y = 40$ ksi].

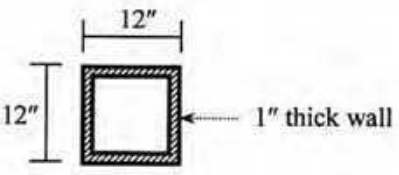




Member Section

14. For the frame shown below, calculate the
    (i) distributed load (w k/ft) needed to cause buckling of columns ae and df,
    (ii) maximum bending moment in the columns if w is equal to half the load calculated in (i)
    [Given: Modulus of elasticity $E = 3000$ ksi].





Cross-section

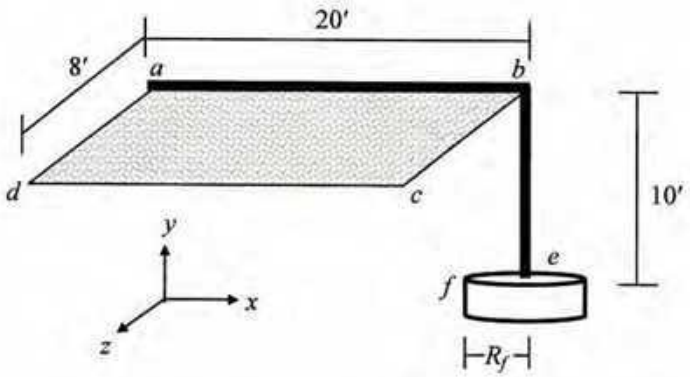
The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010 (Set B2)
Program: B. Sc. Engineering (Civil)

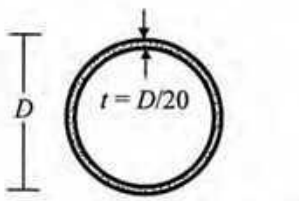
Course Title: Mechanics of Solids II | Credit Hours: 3.0 | Course Code: CE 213
Time: 3 hours | Full Marks: 100 (= 10 × 10)

[Answer **any 10 (ten)** of the following 14 questions]

1. Calculate the equivalent polar moments of inertia (J_{eq}) for the three cross-sections shown below by centerline dimensions [Given: Wall thickness = 0.10″ throughout].

2. Slab *abcd* carries a uniformly distributed load of 100 lb/ft^2, and is supported by beam *ab* and column *be* as shown in the figure below.
   (i) Draw the torque diagram of beam *ab*,
   (ii) Calculate the required diameter (D) and thickness (t) of <u>beam *ab*</u>, if the allowable torsional shear stress is 15 ksi and allowable torsional rotation is 1° [Given: Shear modulus $G = 12 \times 10^6$ psi].

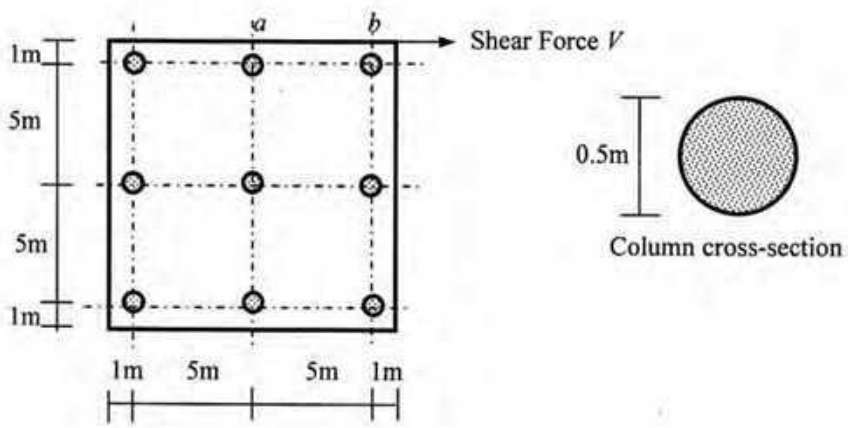




Cross-section of beam *ab* and column *be*

3. For the frame structure described in Question 2, calculate the required
   (i) diameter (D) and thickness (t) of <u>column *be*</u>, if the allowable normal stress is 20 ksi,
   (ii) radius (R_f) of the circular footing *f* in order to avoid overturning.

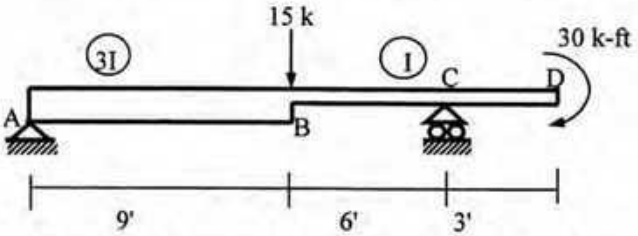
4. Figure below shows the plan of a building floor supported by nine columns.
   Calculate the resultant (combined direct and torsional) shear force and stress in columns *a* and *b* due to the shear force $V = 1000$ kN, applied as shown.



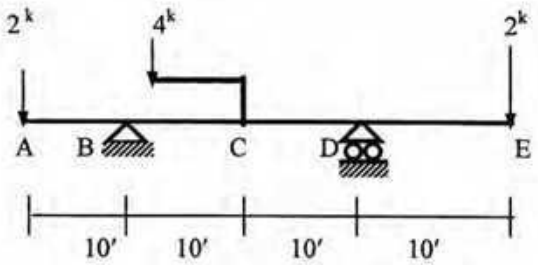
Column cross-section

5. Figure below shows elements a and b on two sides of a retaining wall.
   – Element a: Vertical stress = γh, and horizontal stress = $3\gamma h$
   – Element b: Vertical stress = γH, and horizontal stress = $\gamma H/3$
   If γ = Unit weight of soil = 20 kN/m^3, and shear stress is zero for both element, draw the Mohr's circle of stress for both a and b, showing the
   (i) Principal stresses and planes, (ii) Maximum shear stresses and corresponding planes.

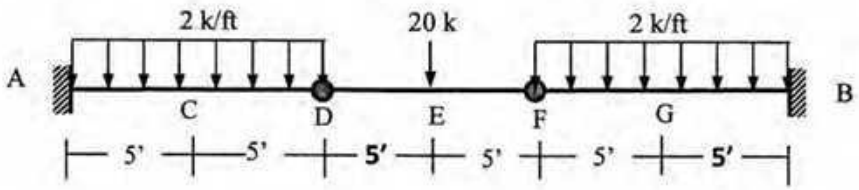
6. For the beam shown below, use the Moment-Area Theorems to calculate the expression of deflection. Calculate the value of moment of inertia 'I' if deflection at point B is 0.1".
   Also calculate the slope at B and D [Given: E = 30000 ksi].



7. Calculate the deflection at C and the rotation at B using conjugate beam method [EI = 40,000 k-ft^2].



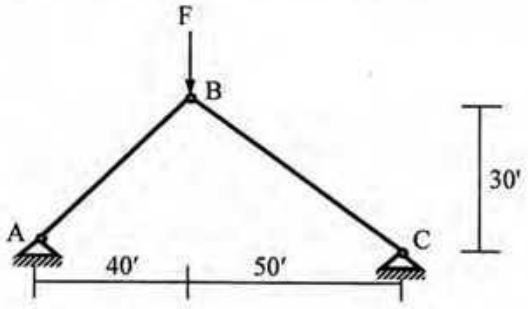
8. Using Singularity function method determine the deflection and slope of the beam shown below at points C, D and E [Given: EI = 40000 k-ft^2].



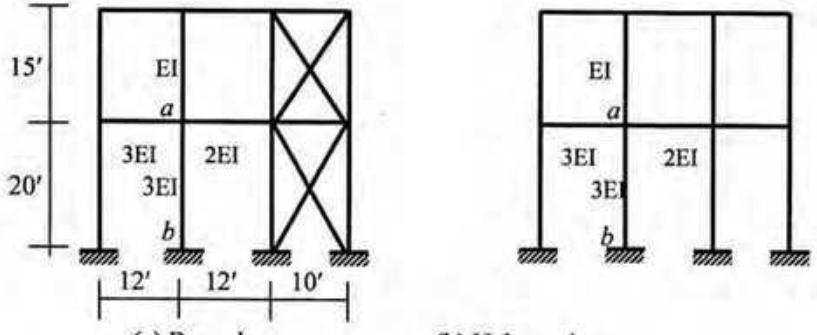
9. For the beam shown in Question 8, calculate the deflection and slope at points C, E using the conjugate beam method.

10. For the beam shown in Question 8, calculate the deflection and slope at points C, D and E using the moment area method.

11. In the pin-connected plane structure shown below, determine the maximum allowable load F that can be applied using the AISC-ASD design criteria for buckling
[Given: AB and BC are 2" dia and 6" dia circular cross sections, yield strength f_y = 60 ksi, modulus of elasticity E = 29000 ksi].



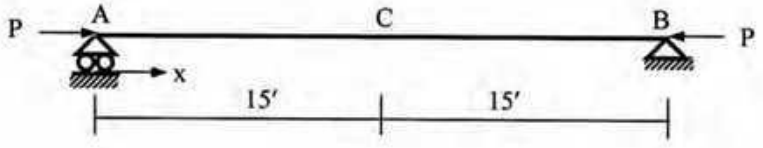
12. Calculate the buckling load in column *ab* if the frame is (i) braced, (ii) unbraced
[Given: E = 30,000 ksi, cross-section of top-floor column is 2″× 4″ rectangular].



(a) Braced (b) Unbraced

13. (a) What are the assumptions for Euler solution against buckling of column?
(b) Prove mathematically, for a fixed-hinged supported column the effective length factor is 0.7.
(c) Draw and comment on the qualitative figures showing the effect of initial imperfection on critical load and effect of end moment on magnification of bending moment.

14. The compression member ACB shown below has an initial deflected shape of $v_i(x) = v_{0i} \sin(\pi x/L)$. If the deflection at C for P = 100 ^{k} is 1″, calculate the value of v_{0i} and the deflection at C for P = 200 ^{k}
[Given: EI = 4×10^6 k-in^2].



The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B.Sc. Engineering Civil

Course Title: Fluid Mechanics | Course No : CE 221 | Credit Hours: 3.00
Time : 3.0 hours | Full Marks : 150

Answer any 6 (SIX) questions. Figures in the right margin indicate full marks.

1 a. Distinguish between, (i) Lagrangian and Eulerian Method 6
(ii) Pathlines and Streamlines
(iii) Uniform and Non-Uniform Flow

b. A circular pipe of 15 cm diameter is filled with glycerine as shown in Figure 1. Determine the force required to drag a 5 cm diameter solid iron tube of 1 meter length at a constant speed of 1 m/s. Assume velocity distribution in the pipe is, $v= 6 (R^2-r^2)$ m/s and the centre of the tube coincides with the centre of the pipe. Take dynamic viscosity 0.05 N-s/m^2 9

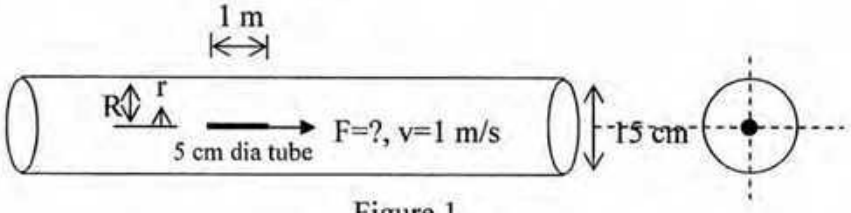


Figure 1

c. Determine the capillary rise of water in a soil of average diameter 0.06 mm. Assume the average size of pores in soil to be one-fifth of the soil diameter. Take σ = 0.074 N/m. 5

d. By how much does the pressure in a cylindrical jet of water 6 mm in diameter exceed the pressure of the surrounding atmosphere if the surface tension of water is 0.075 N/m. 5

2 a. If the atmospheric pressure is 101.00 kN/m^2. Calculate, 4
(i) gauge pressure of a point whose absolute pressure is 150 kN/m^2. and,
(ii) vacuum pressure of a point whose absolute pressure is 50 kN/m^2.

b. What is a piezometer? Can a piezometer be used for measuring pressure in the pipe in which a gas is flowing? 4

c. State Pascal's Law. 2

d. A jet of water coming out from a 25 mm diameter nozzle is directed vertically upward. Calculate the diameter of the jet at a point 5 m above the nozzle if the velocity with which the jet leaves the nozzle is 15 m/s. Neglect lossses. 6

e. Calculate h_1, P_A and h_2 from Figure 2. *9*

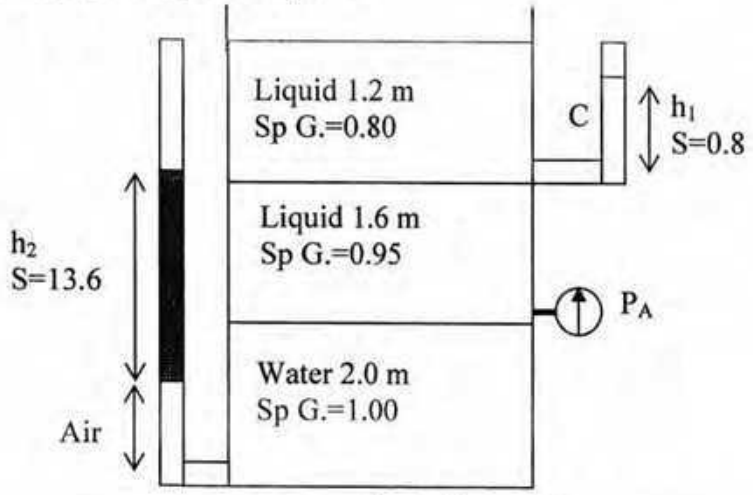


Figure 2

3 a. State Bernoulli equation and explain each term with neat figure. Mention clearly the assumptions made in the equation. *6*

b. What do you understand by the term 'centre of pressure'? *6*

c. The following Figure 3 shows a gate AB hinged at the end A. If the gate is 1.5 m wide, calculate the horizontal force (F) required at B to keep the gate in equilibrium. *13*

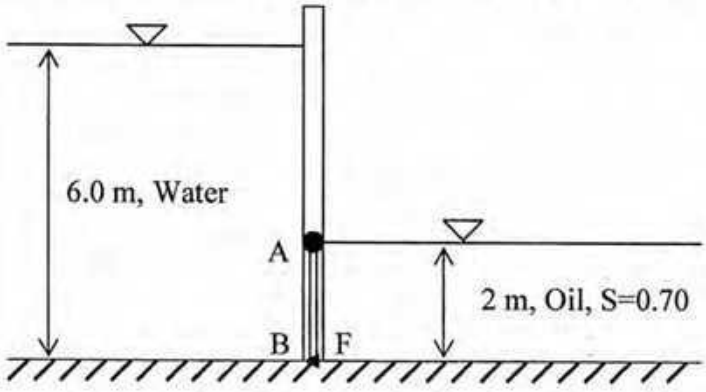


Figure 3

4 a. Calculate the total hydrostatic pressure exerted upon the vertical wall AB shown in Figure 4. Assume length of wall is 0.5 m. *6*

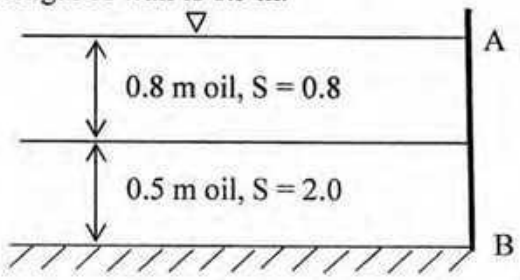


Figure 4

b. Determine the horizontal and vertical forces acting on the curve surface AB on the cylinder in Figure 5. The cylinder is 1 m long. The diameter of the cylinder is 2.0 m. 7

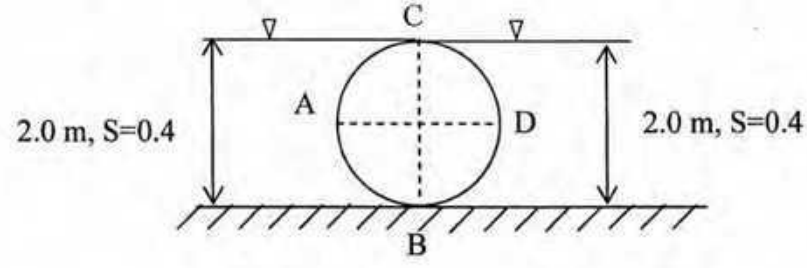


Figure 5

c. Determine the horizontal and vertical forces acting on the curve surface CD on the cylinder in Figure 5. 7

d. What is the net vertical force acting on the cylinder shown in Figure 5, if it weighs 25.0 kN. Neglect friction. 5

5 a. Define, (i) coefficient of contraction (ii) coefficient of velocity, and (iii) coefficient of discharge 9

b. Water enters in a 120^0 horizontal reducing pipe with a velocity of 5 m/sec and a pressure of 80 kN/m^2 as shown in Figure 6. If the diameters at the entrance and exit sections are 25 cm and 15 cm respectively, calculate the components of the reaction e.g. R_X and R_Y acting on the pipe. 16

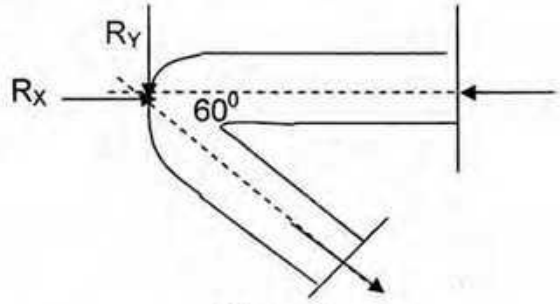


Figure 6

6 a. What is the difference between a weir and an orifice? How are the weirs classified? 6

b. A rectangular channel 10 m wide has a broad crested rectangular weir at the end of the channel. A discharge of 10 m^3/s passes over it. Determine the height to which the weir be built if the depth of water behind the weir is not to exceed 2 m. Take C_d=0.60. 6

c. The rate of flow of water over a V-notch with apex angle $\theta = 60^0$ is 0.05 cumecs. Find the head over the crest if C_d =0.62. 5

d. The inlet and the throat diameter of a venturimeter shown in Figure 7 are 12 cm and 8 cm, respectively. Calculate the pressure difference between inlet and the throat. The velocity of water in the pipe is 4 m/s. Ignore losses. 8

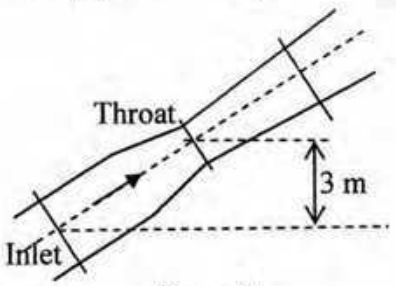


Figure 7

7 a. What is Dimensional analysis? What are the different applications of the principles of Dimensional homogeneity in fluid mechanics? 6

b. Check whether the following equations are dimensionally homogenous: 6

a. $\sum F = \rho Q(V_2 - V_1)$ b. $h = \frac{4\sigma \cos\theta}{\gamma d}$ c. $h' = \frac{I_G}{A\bar{h}} + \bar{h}$

c. Find total minor losses of Figure 8. Assume, Q= 0.05 m^3/s. 13

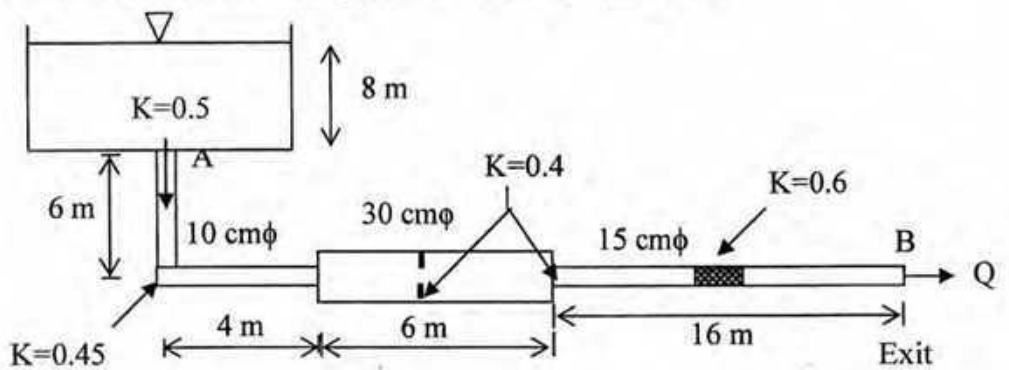


Figure 8

8 a. What do you understand by 'minor losses' in pipes? Mention the places with neat sketches where minor losses may occur. 5

b. Figure 9 Shows three reservoirs connected by pipes. Find the discharge in each pipe. Take f=0.04. The diameter and length of the pipes are as follows: 20

Pipe	Diameter (mm)	Length (m)	Discharge (m^3/s)
AB	400	1500	Q_1
BC	200	1000	Q_2
BD	300	500	Q_3

Assume $Q_1 = Q_2 + Q_3$ and apply trial and error method for solving equations.

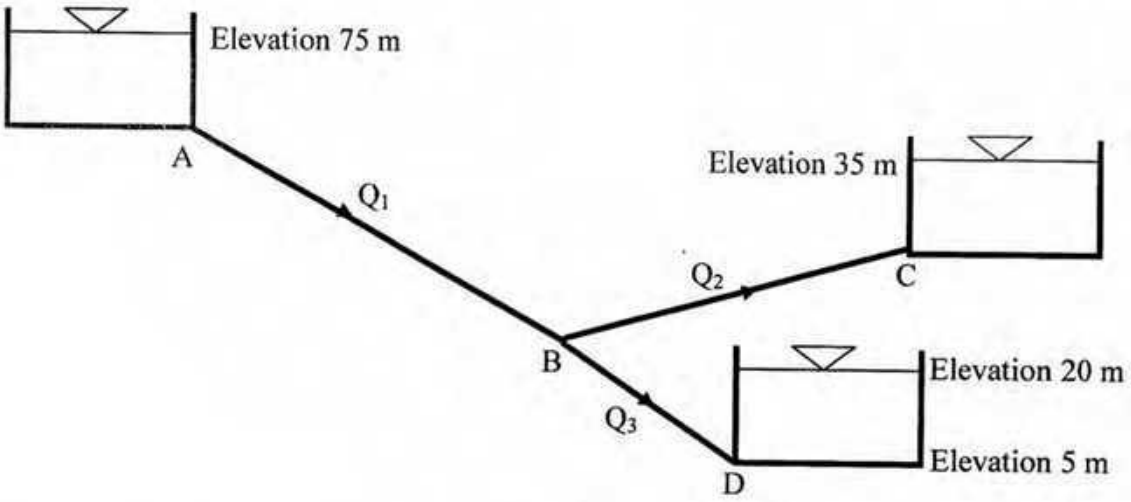


Figure 9

Formulae

$$\tau = \mu\frac{dv}{dy} \qquad P_i - P_o = \sigma(\frac{1}{R_1}+\frac{1}{R_2}) = \frac{2\sigma}{R} = \frac{4\sigma}{R} = \frac{\sigma}{R} \qquad h = \frac{4\sigma\cos\theta}{\gamma d}$$

$$P = \gamma h \qquad P = \lambda A\bar{h} \qquad h' = \frac{I_G}{A\bar{h}} + \bar{h} \qquad h' = \frac{I_G Sin^2\theta}{A\bar{h}} + \bar{h}$$

$$P_H = \gamma\bar{h}A_V \qquad P_V = \gamma V = W \qquad P = \sqrt{P_H{}^2 + P_V{}^2} \qquad \sum M_o = \rho Q(\Delta V)$$

$$V_0 = \sqrt{2gh} \qquad Q = C_d a\sqrt{2gH} \qquad C_d = C_C \times C_V \qquad C_V = \sqrt{\frac{x^2}{4yH}}$$

$$Q = 0.855a\sqrt{2gH} \qquad Q = 0.707a\sqrt{2gH} \qquad Q = \frac{2}{3}C_d b\sqrt{2g}H^{\frac{3}{2}}$$

$$b' = b - 0.1\times n\times H \qquad H_a = \frac{V_a{}^2}{2g}$$

$$Q = \frac{2}{3}C_d[b - 0.1n(H+H_a)]\sqrt{2g}\left[(H+H_a)^{\frac{3}{2}} - H_a{}^{\frac{3}{2}}\right] \qquad Q = 1.705C_d bH^{\frac{3}{2}}$$

$$Q = CbH_s{}^{\frac{2}{3}} \qquad Q = C_d A\sqrt{2gy_1} \qquad Q = \frac{8}{15}C_d\sqrt{2g}\tan\frac{\theta}{2}H^{\frac{5}{2}} \qquad Q = CbH^n$$

$$h_f = f\frac{L}{D}\frac{V^2}{2g} \qquad V = C\sqrt{RS} \qquad C = \sqrt{\frac{8g}{f}} \qquad V = \frac{1}{n}R^{\frac{2}{3}}\sqrt{S}$$

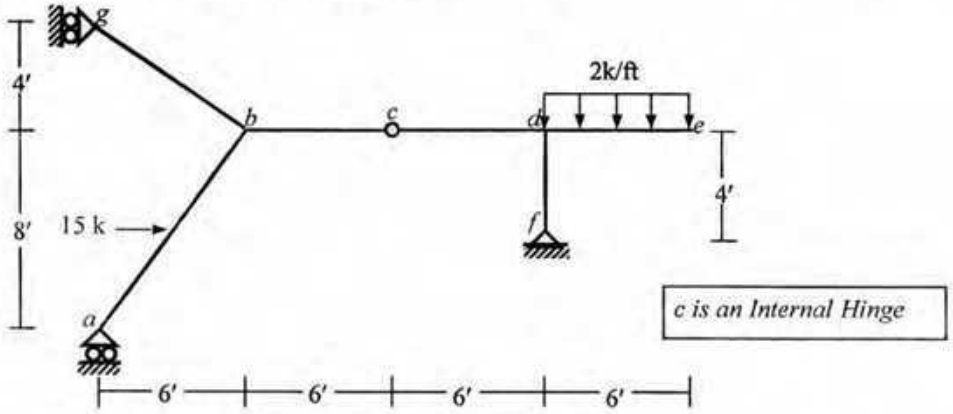
$$C = \frac{1}{n}R^{\frac{1}{6}} \qquad H_L = \frac{(V_1 - V_2)^2}{2g} \qquad H_L = K\frac{V^2}{2g}$$

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B. Sc Engineering (Civil)

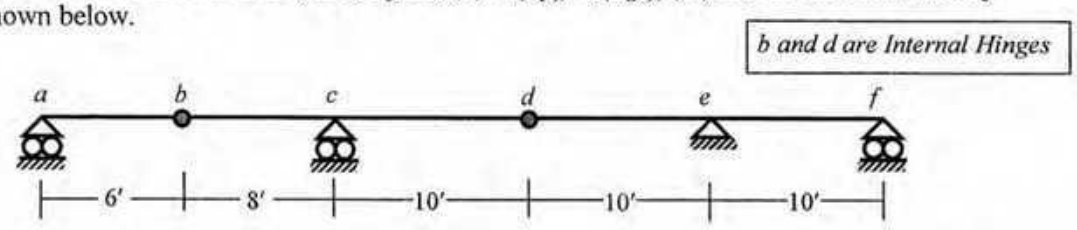
Course Title: Structural Engineering I — Course Code: CE 311
Time: 3.00 Hours — Full Marks:100

[Answer **any 10 (ten)** of the following 14 questions]

1. Determine the degree of statical indeterminacy (dosi) of the frame *abcdefg* shown below and also draw the AFD, SFD and BMD of the frame.



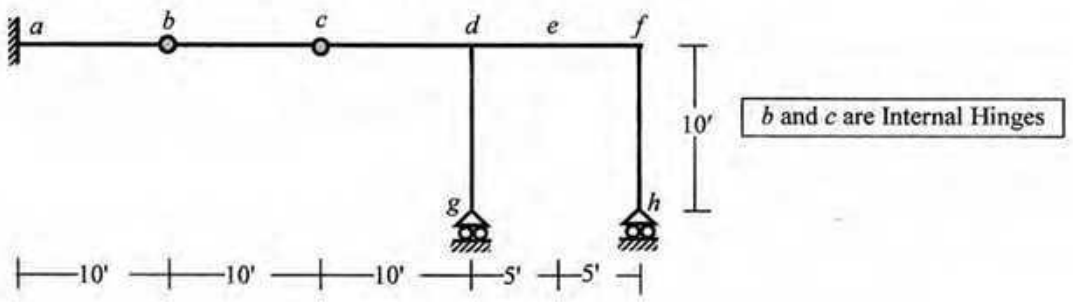
2. Draw the influence lines of (i) R_a, R_f, R_c, (ii) $V_{c(Left)}$, $V_{e\ (Right)}$, (iii) M_c for the beam *abcdef* shown below.



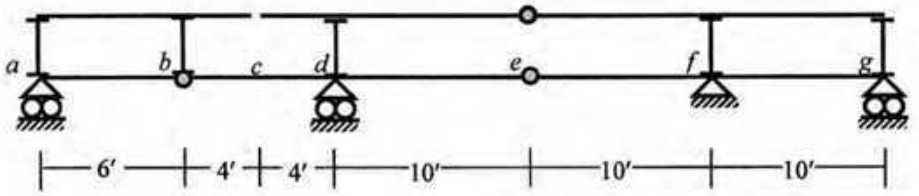
3. Calculate the maximum positive and negative values of both R_e (reaction at support *e*) and M_e (moment at support *e*) for the beam *abcdef* in Question 2, for a uniformly distributed dead load of 1 k/ft, a moving uniformly distributed live load of 0.5 k/ft and a moving concentrated load of 15 k.

4. Show that the frame *abcdefgh* shown below is statically determinate.

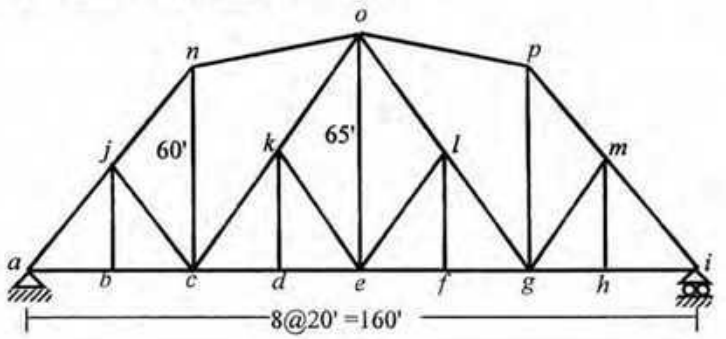
   Also draw the influence lines of support reactions X_a, Y_g , $V_{d(right)}$ and M_e, if the unit load moves over (i) beam *af*, ii) column *gd*, iii)column *hf*.



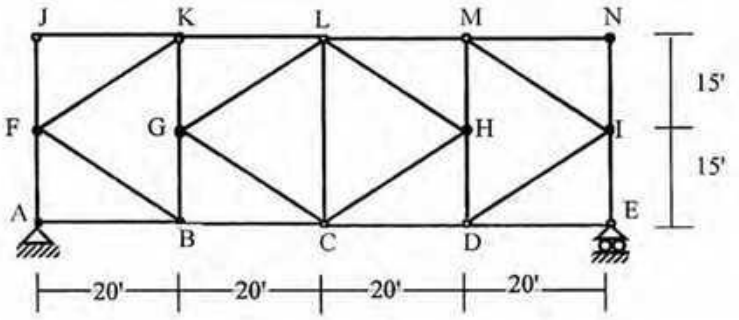
5. For the plate girder *abcdefg* shown below, draw the influence lines of R_f, $V_{d(left)}$, V_e and M_f.



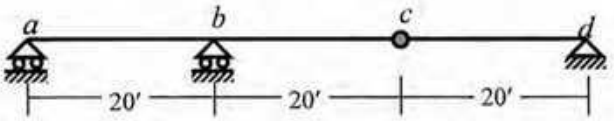
6. Determine the degree of statical indeterminacy (dosi) of the truss shown below and also draw the influence lines for the forces in members *no*, *ck* and *cd*. [Note: Stringers are simply supported on floor-beams at bottom-cord joints].



7. For the truss shown below, calculate the maximum tensile and compressive forces in member CH and maximum tensile force in member CD, for a uniformly distributed dead load of 1 k/ft, a moving uniformly distributed live load of 2 k/ft and a moving concentrated load of 20 k.
[Note: Stringers are simply supported on floor-beams at bottom-cord joints].

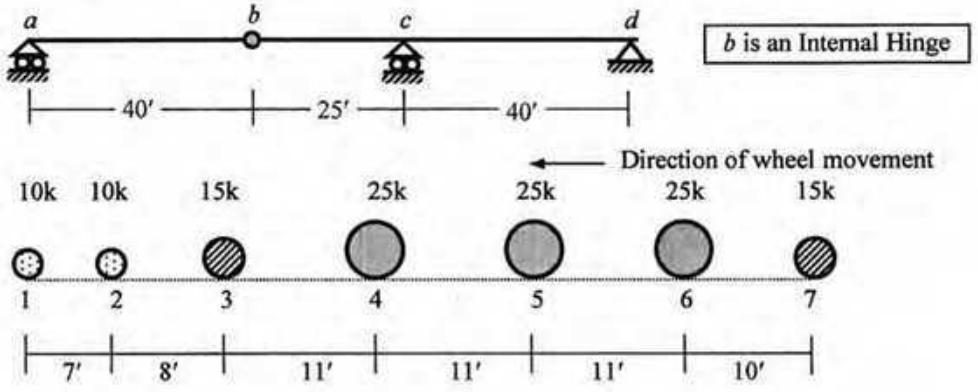


8. Draw the design bending moment diagram of the beam *abcd* shown below [based on influence lines of moment at midpoint of *ab* and moment at point *b*] for a uniformly distributed dead load of 1 k/ft and moving uniformly distributed load of 2 k/ft.

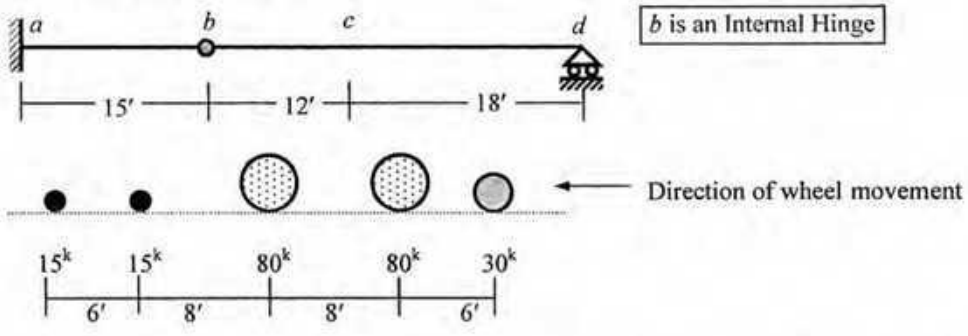


c is an Internal Hinge

9. For the moving wheel loads shown below, calculate the maximum value of R_a (reaction at *a*) for the beam *abcd* shown below.

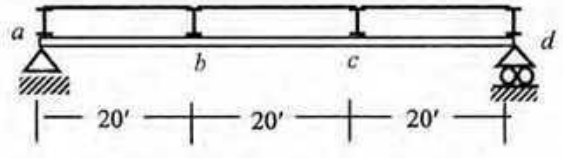


10. For the moving wheel loads shown below, calculate the maximum value of V_c (shear force at *c*) for the beam *abcd* shown below.

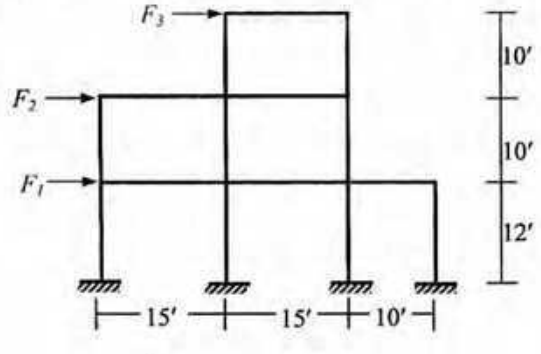


11. Calculate the greatest maximum moment of a 80' simply supported beam for the wheel arrangement shown in Question 9.

12. For the wheel loads shown in Question 9, calculate the maximum value of $V_{b\text{-}c}$ for the plate girder shown below.



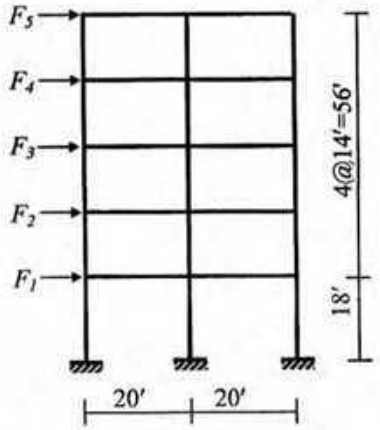
13. The three-storied RCC residential building frame shown below is situated on a hilly terrain (with H = 10′, L_u = 100′). If the first story force due to wind is F_1 = 12 kips, calculate the
    (i) story forces F_2 and F_3 (if the frame is subjected to Exposure C)
    (ii) basic wind speed, V_b [Given: C_p=1.1 and frame width=20'].



14. The five-storied RCC residential building frame described below is supported on stiff soil (with S = 1.2). Assume each beam to weigh 2 k/ft. If the fifth story force due to earthquake is $F_5 = 15$ kips, calculate the

(i) seismic base shear force

(ii) zone coefficient Z (Given: $R = 5.0$).



List of Useful Formulae for CE 311

*$\Delta R = \{(\sum P)\, d_1 + P'\, e\} i/L - P_1 \times i$

*$\Delta V = (\sum P)\, d_1 /L + P'\, e/L + P_0\, e_0/L - P_1$

* $(W_1/P) \times (s + a)/s \geq W/L$

* $(W_1/P) \times (s + a + P)/(s + L) \geq W/L$

*$W_1/a \geq W/L$

*$W_1/P \geq W/L$

*The design wind pressure at a height z is $p_z = 0.00256\, C_I\, C_z\, C_G\, C_t\, C_p\, V_b^2$, design wind force $F_z = B\, h_{eff}\, p_z$

* The total design base shear is $V = (ZIC/R)\, W$ where $C = 1.25\, S/T^{2/3}$

* $F_t = 0.07\, TV \leq 0.25V$ when $T > 0.7$ second, and $= 0$, when $T \leq 0.7$ second

* $F_j = (V - F_t)\, [w_j\, h_j / \sum w_i\, h_i]$

* Structural Period $T = C_t (h_n)^{3/4}$, where, $C_t = 0.083$ for steel moment resisting frames, 0.073 for RC moment resisting frames and eccentric braced steel frames, 0.049 for all other structural systems

* The basic wind speeds at different important locations of Bangladesh:

Location	V_b (mph)
Dhaka	130
Chittagong	160
Rajshahi	95
Khulna	150

* Tables for Wind Pressure Coefficients

Category	C_I
Essential facilities	1.25
Hazardous facilities	1.25
Special occupancy	1.00
Standard occupancy	1.00
Low-risk structure	0.80

Height z (ft)	C_z		
	Exp A	Exp B	Exp C
0~15	0.368	0.801	1.196
50	0.624	1.125	1.517
100	0.849	1.371	1.743
150	1.017	1.539	1.890
200	1.155	1.671	2.002
300	1.383	1.876	2.171
400	1.572	2.037	2.299
500	1.736	2.171	2.404
650	1.973	2.357	2.547
1000	2.362	2.595	2.724

Height z (ft)	C_G (for non-slender structures)		
	Exp A	Exp B	Exp C
0~15	1.654	1.321	1.154
50	1.418	1.215	1.097
100	1.309	1.162	1.067
150	1.252	1.133	1.051
200	1.215	1.114	1.039
300	1.166	1.087	1.024
400	1.134	1.070	1.013
500	1.111	1.057	1.005
650	1.082	1.040	1.000
1000	1.045	1.018	1.000

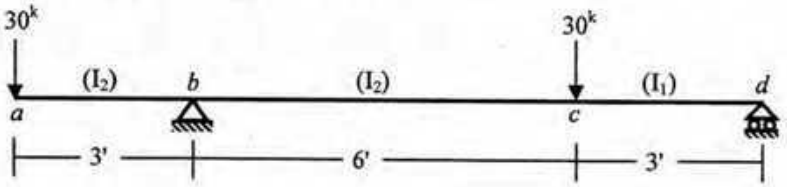
$H/2L_u$	C_t
0.05	1.19
0.10	1.39
0.20	1.85
0.30	2.37

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B. Sc. Engineering (Civil)

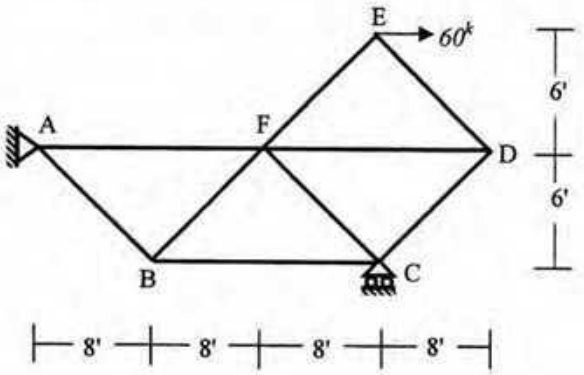
Course Title: Structural Engineering II | Credit Hours: 3.0 | Course Code: CE 313
Time: 3 hours | Full Marks: 90 (= 10 × 9)

[Answer **any 9 (Nine)** of the following 12 questions]

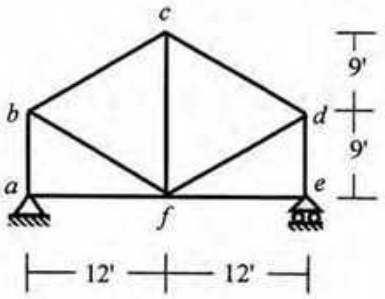
1. Calculate the vertical deflection of point *a* using the virtual work method [Given; E = 30000 ksi $I_1 = 300$ in^4, $I_2 = 600$ in^4].



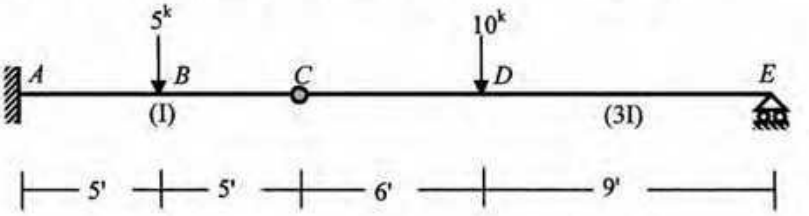
2. Calculate the total deflection of point B (∂_B) for the applied load using the virtual work method [Given: E = 30000 ksi, A = 10 in^2 for all members and use the formula $\partial_B = \sqrt{(\partial^2_{Bh}+\partial^2_{Bv})}$].



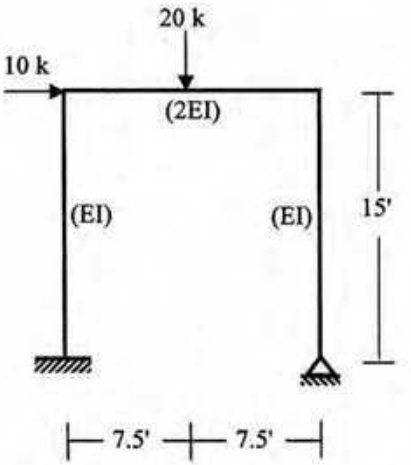
3. Calculate the horizontal deflection of *b* using the virtual work method if
   (i) Member bf is fabricated 1″ shorter than specified.
   (ii) Temperature of bottom cords is increased by 80°F. [Given: a_t= 1/150000 /°F]



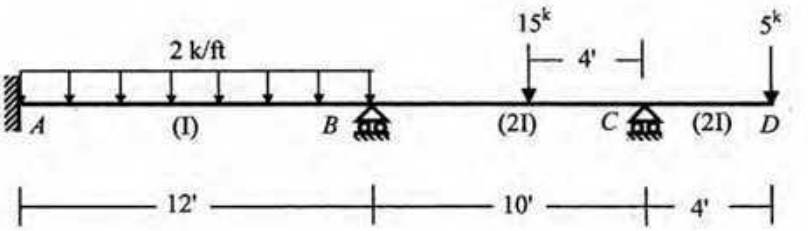
4. Calculate the deflection of point *D* due to the applied loads and the movement of support A = 0.5″ (↓) using the virtual work method [Given: E = 30000 ksi, I = 550 in^4].



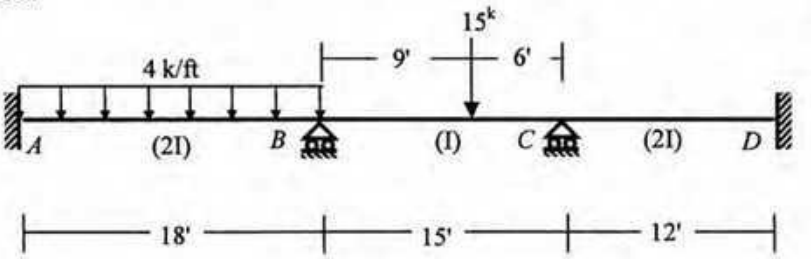
5. Draw the bending moment diagram of the frame shown below using the consistent deformation method.



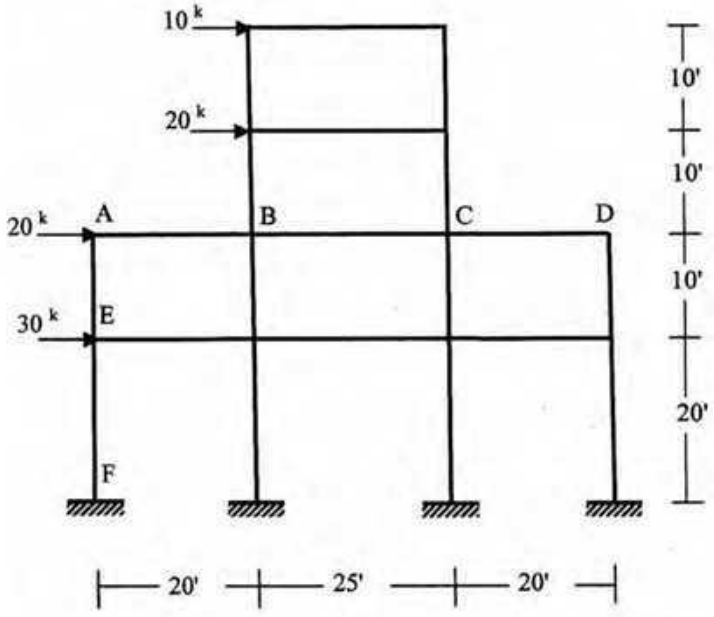
6. Draw the shear force diagram of the beam *ABCD* shown below using the moment distribution method.



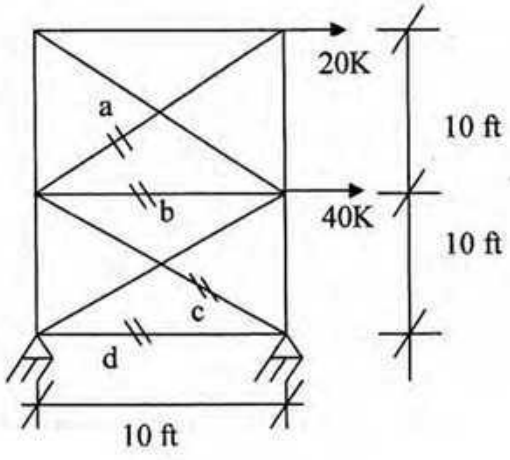
7. Draw the bending moment diagram of the beam *ABCD* shown below using the moment distribution method.



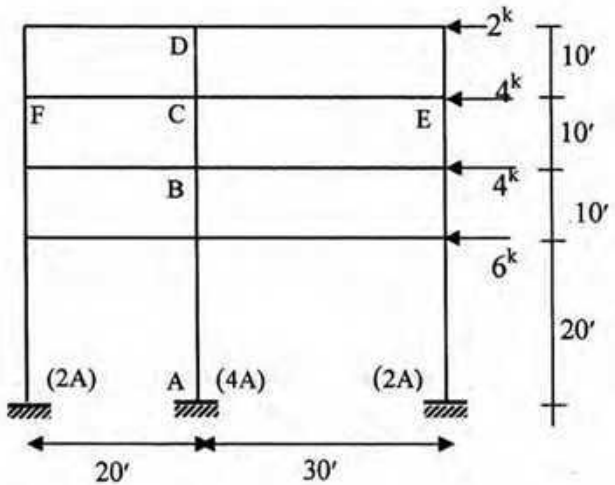
8. Draw the bending moment diagram for the girder ABCD and the shear force diagram for the column AEF using the portal method.



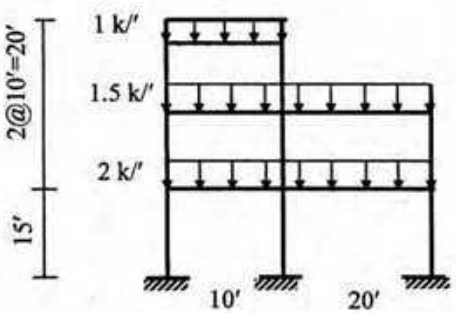
9. Determine the forces in members a, b, c and d of the truss shown in the figure below assuming that all members can carry both tension and compression. Use approximate method of analysis.



10. For the building frame shown below draw the bending moment and shear force diagrams for the beam ECF and column ABCD using the Cantilever method.



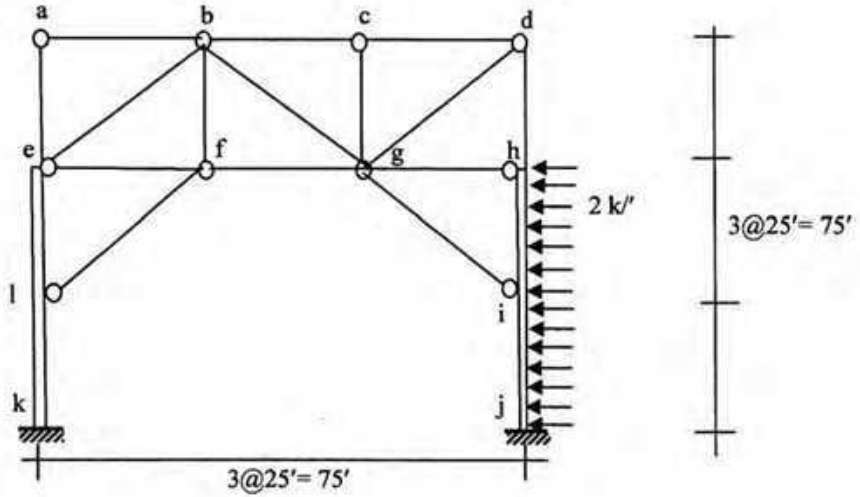
11. Draw the bending moment and shear force diagram for the frame loaded as shown below. Use approximate method of analysis by making necessary assumptions [Given: EI is constant for all columns].



12. For the bridge portal shown in the figure below

i) Draw the approximate shear force and bending moment diagrams of column hij.

ii) Compute bar forces for the members cg, bg and bc



INTEGRATION RESULT

$I = \int m_i m_j \, dx$ Values

m_j \ m_i	A, l	A, l	A, l	A, B, l	A, B, C, l/2, l/2
a, l	Aal	Aal/2	Aal/2	(A+B)al/2	(A+4B+c)al/6
a, l	Aal/2	Aal/3	Aal/6	(A+2B)al/6	(2B+C)al/6
a, l	Aal/2	Aal/6	Aal/3	(2A+B)al/6	(A+2B)al/6
a, b, l	A(a+b)l/2	A(a+2b)l/6	A(2a+b)l/6	{A(2a+b)+B(2b+a)}l/6	{Aa+Cb+2B(a+b)}l/6

$a \geq b$ or $a \leq b$

[a. b can be –ve or +ve]

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B.Sc. Engineering (Civil)

Course Title: Design of Concrete Structures | Course Code: CE 315
Time: 3 (three) hours | Full Marks: 210

There are **EIGHT** *questions. Answer any* **SIX** *questions.*

[Use ACI/USD method for all problems. Symbols carry their usual meanings. Tables are attached at the end to facilitate design. Assume reasonable values for any missing data]

1. (a) Why shear design of RCC beam is empirical – explain? **(5)**

(b) Determine ultimate moment capacity of the T-beam as shown in Figure 1. **(30)**

Given, $f'_c = 3000$ psi, $f_y = 50000$ psi.

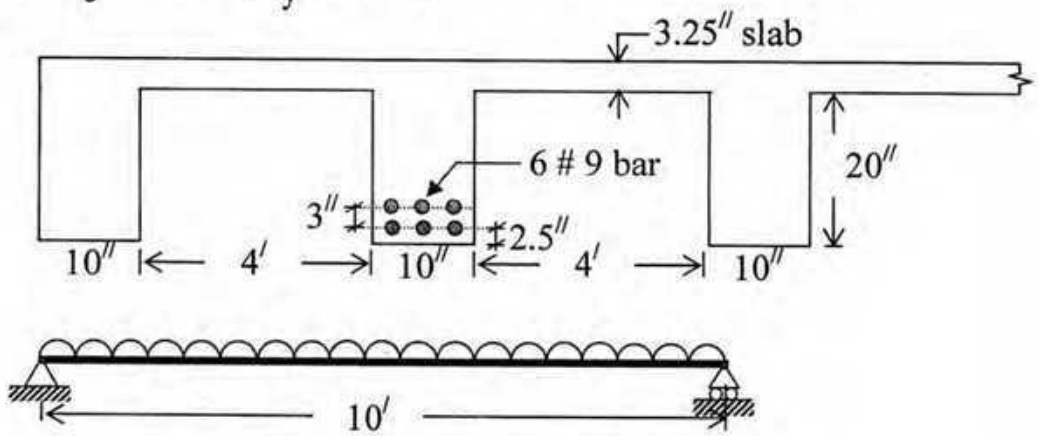


Figure 1 for Question 1(b)

2. Design and detail the L-beam 'B1' as shown in Figure 2. Given, span of beam = 20 feet (simply supported) $f'_c = 3000$ psi, $f_y = 50000$ psi. **(35)**

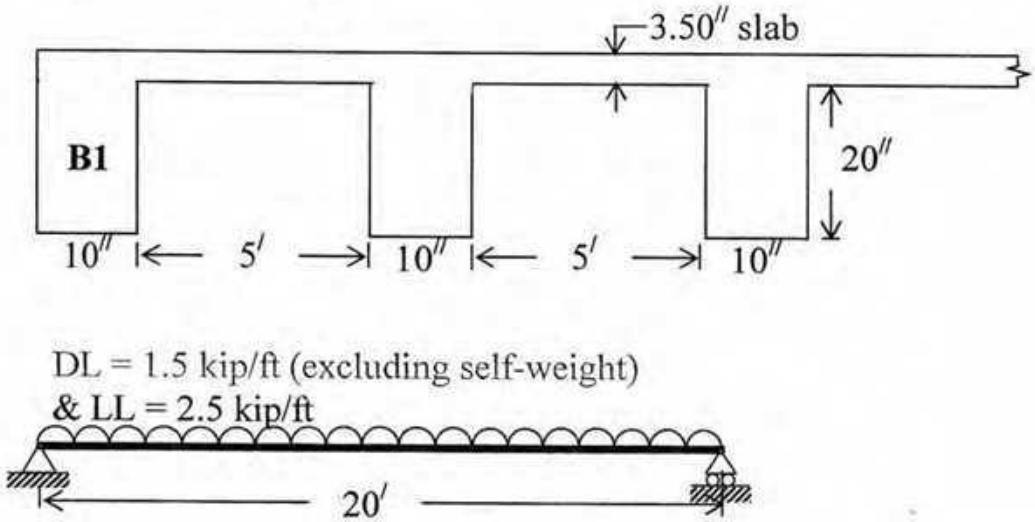


Figure 2 for Question 2

3. Determine shear reinforcement and stirrup layout for the beam as shown in Figure 3. **(35)**
Given, $f'_c = 3000$ psi & $f_y = 60000$ psi.

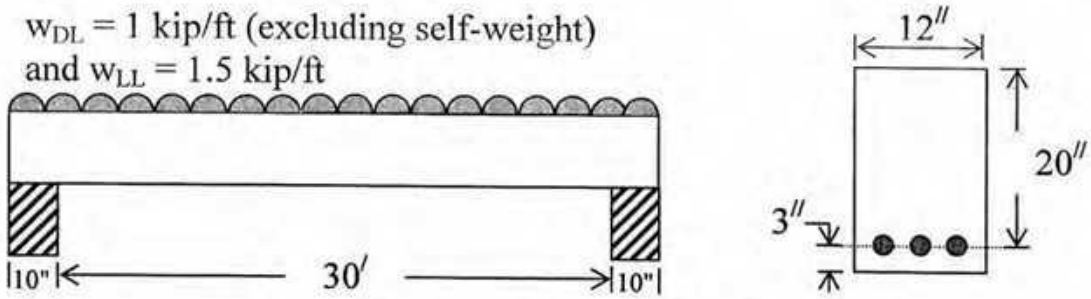


Figure 3 for Question 3(b)

4. (a) Discuss briefly the factors that influence development length of a reinforcing bar. **(3)**
(b) Prove that the bond force per unit length is proportional to the shear at a particular section. **(8)**
(c) Why development length for top bars is greater than that of bottom bars of a beam? **(4)**
(d) Can a # 5 bar (see Figure 4) stressed to 90% of its yield point at the face of the column be safely anchored if the bar ends in a standard 90° hook? Given, $f'_c = 3500$ psi, $f_y = 60000$ psi. **(20)**

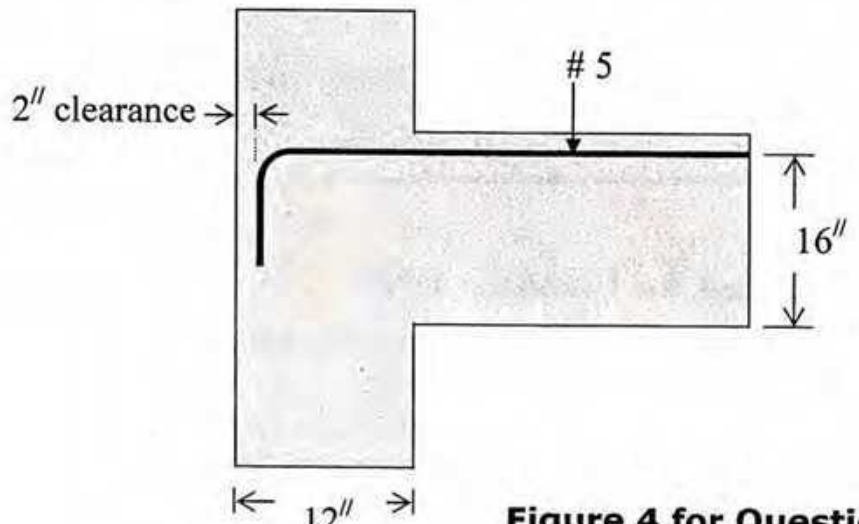


Figure 4 for Question 4(d)

5. (a) For embedment of 8 # 6 dowel bars into the footing slab (see Figure 5), determine the minimum footing thickness (t_{min}) required. **(10)**

(b) The beam (simply supported span = 20 ft) shown in Figure 6 is to carry a dead load of 0.92 kip/ft (excluding self-weight) and a live load of 1.3 kip/ft. The reinforcement consist of **(25)**

3 # 6 bars and 3 # 7 bars. Calculate the point where the upper 3 # 6 bars can be discontinued.

Given, $A_{s,(supplied)} = A_{s,(required)}$, $f'_c = 4000$ psi, $f_y = 60000$ psi.

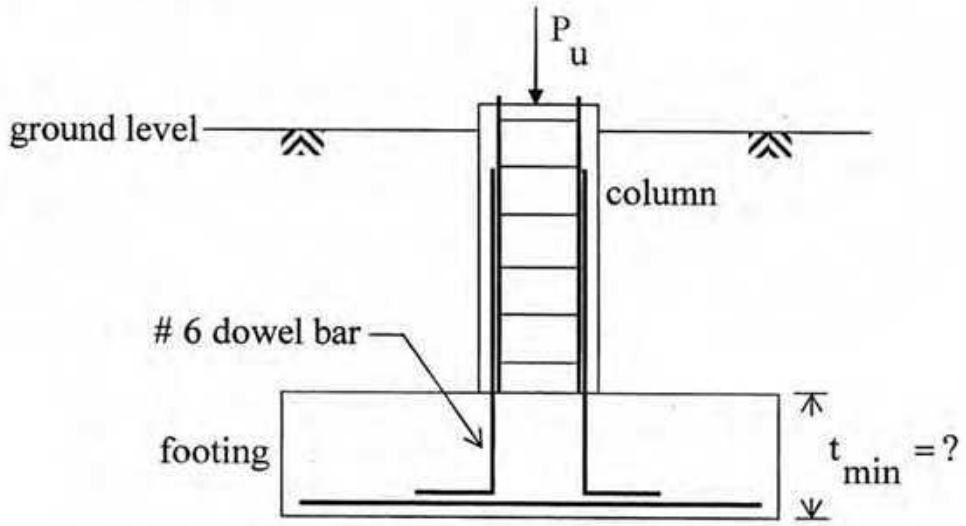


Figure 5 for Question 5(a)

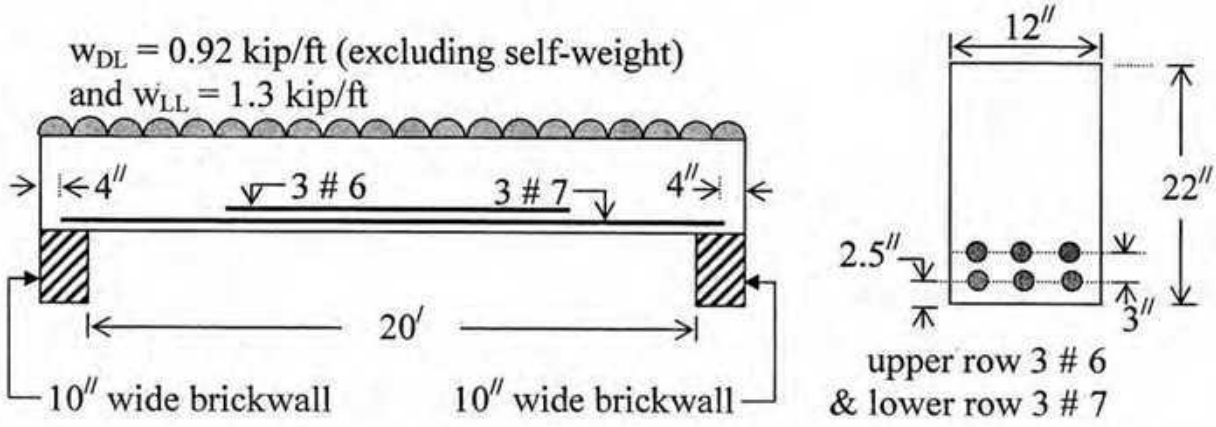


Figure 6 for Question 5(b)

6. (a) Calculate development lengths of # 9 bar in tension for (i) top bars and (ii) bottom bars. **(8)**

Given, $f'_c = 4000$ psi, $f_y = 60000$ psi.

(b) To facilitate construction of a retaining wall, the vertical wall steel in Figure 7 is to be spliced to dowels from the foundation. If the flexural steel is fully stressed to its yield point at the bottom of the wall, what is splice length required? Given, $f'_c = 4000$ psi, $f_y = 60000$ psi. **(13)**

(c) If # 9 bars are to be spliced to # 10 bars, and if the bars are confined by a closely spaced spiral (Figure 8), what is the minimum required lap length (l_{splice}) for the splice? Given, f'_c = 4000 psi, f_y = 60000 psi. (spirals are not shown in figure). **(14)**

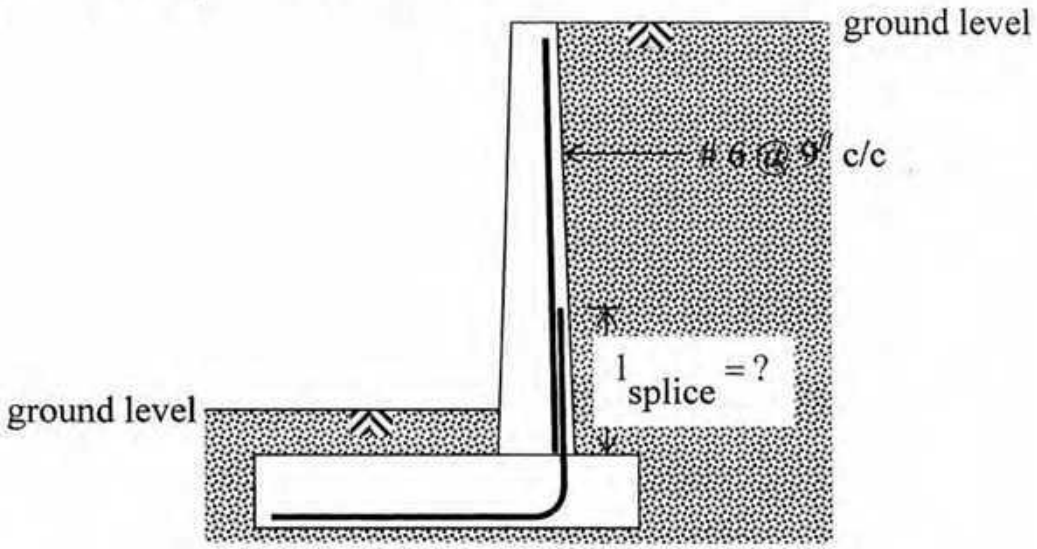


Figure 7 for Question 6(a)

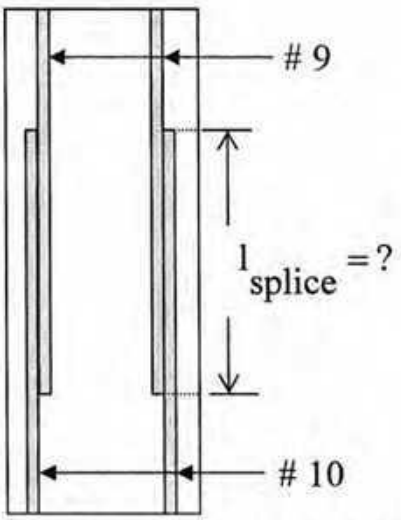


Figure 8 for Question 6(c)

7. (a) Why temperature and shrinkage reinforcements are provided in one-way slabs? **(5)**

(b) A cantilever porch (see Figure 9) is to be designed to support a uniform live load of 20 psf, lime concrete of 30 psf. Given, f'_c = 3500 psi, f_y = 50000 psi. Show necessary reinforcement in sketches. **(30)**

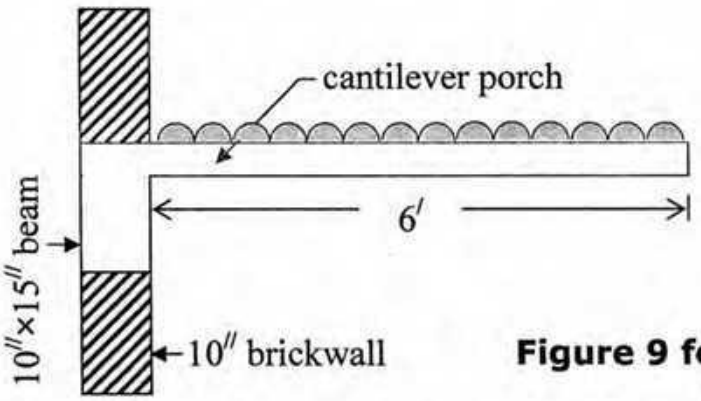


Figure 9 for Question 7(b)

8. (a) Discuss the reasons for the requirement of minimum thickness for one-way slab (specified by the ACI code). **(5)**

(b) Design the slab as shown in Figure 10 to support a uniform live load of 40 psf, floor finish 25 psf and partition wall load of 45 psf, Given, f'_c = 4000 psi, f_y = 60000 psi. Show necessary reinforcement in sketches. **(30)**

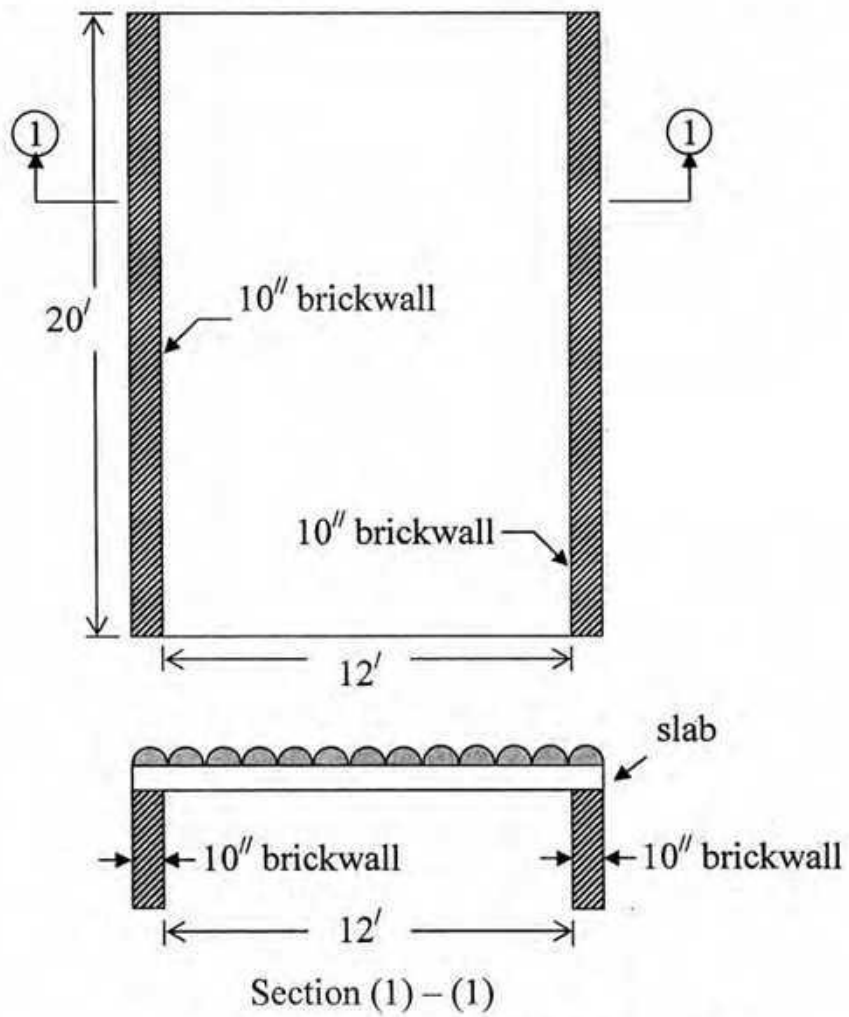


Figure 10 for Question 8(b)

Table 1: Concrete stress-block parameters

	$f_c' \leq 4000$ psi	$f_c' = 5000$ psi	$f_c' = 6000$ psi	$f_c' = 7000$ psi	$f_c' \geq 8000$ psi
α	0.72	0.68	0.64	0.60	0.56
β	0.425	0.40	0.375	0.350	0.325
$\beta_1 = 2\beta$	0.85	0.80	0.75	0.70	0.65
$\gamma = \alpha/\beta_1$	0.85	0.85	0.85	0.85	0.85

Table 2: Designations, areas, perimeters and weights of standard bars

Bar No.	Diameter (inch)	Cross sectional area (square inch)	perimeter (inch)
# 3	0.375	0.11	0.376
# 4	0.500	0.20	0.668
# 5	0.625	0.31	1.043
# 6	0.750	0.44	1.502
# 7	0.875	0.60	2.044
# 8	1.000	0.79	2.670
# 9	1.128	1.00	3.400
# 10	1.27	1.27	4.303
# 11	1.410	1.56	5.313
# 14	1.693	2.25	7.650
# 18	2.257	4.00	13.600

Table 3: Modifiers for development length in tension

Development length in tension, $l_d = \dfrac{0.04A_b f_y}{\sqrt{f_c'}}$ or $0.0004 d_b f_y$ (for # 3 to # 11 bars)

$$l_d = \frac{0.085 f_y}{\sqrt{f_c'}} \text{ (for \# 14 bars) \& } l_d = \frac{0.11 f_y}{\sqrt{f_c'}} \text{ (for \# 18 bars)}$$

	Modifier
Top reinforcement (horizontal reinforcement so placed that more than 12 inch concrete is cast in the member below the bar)	1.4
Reinforcement with $f_y \geq 60000$ psi	$2 - \dfrac{60000}{f_y}$
Lightweight concrete	1.33
Reinforcement spaced laterally at least 6 inch on centers with at least 3 inch clear from face of member to edge of bar	0.80
Reinforcement in a flexural member in excess of that required by analysis (i.e., if $A_{s(supplied)} > A_{s(required)}$	$\dfrac{A_{s(required)}}{A_{s(supplied)}}$
Reinforcement enclosed within a spiral ≥ 0.25 inch diameter with pitch ≤ 4 inch	0.75

* development length in tension must not less than 12 inch.
** for bundle bars, development length of each bar is to increased by 20% for a three-bar bundle and 33& for a four-bar bundle.

Table 4: Modifiers for development length in compression

Development length in compression, $l_d = \dfrac{0.02 d_b f_y}{\sqrt{f'_c}}$ or $0.0003 d_b f_y$ (for # 3 to # 18 bars)

	Modifier
Reinforcement in a flexural member in excess of that required by analysis (i.e., if $A_{s(supplied)} > A_{s(required)}$	$\dfrac{A_{s(required)}}{A_{s(supplied)}}$
Reinforcement enclosed within a spiral $\geq$ 0.25 inch diameter with pitch $\leq$ 4 inch	0.75

* development length in compression must not less than 8 inch.

Table 5: Minimum diameters of bend for standard 90° & 180° hooks

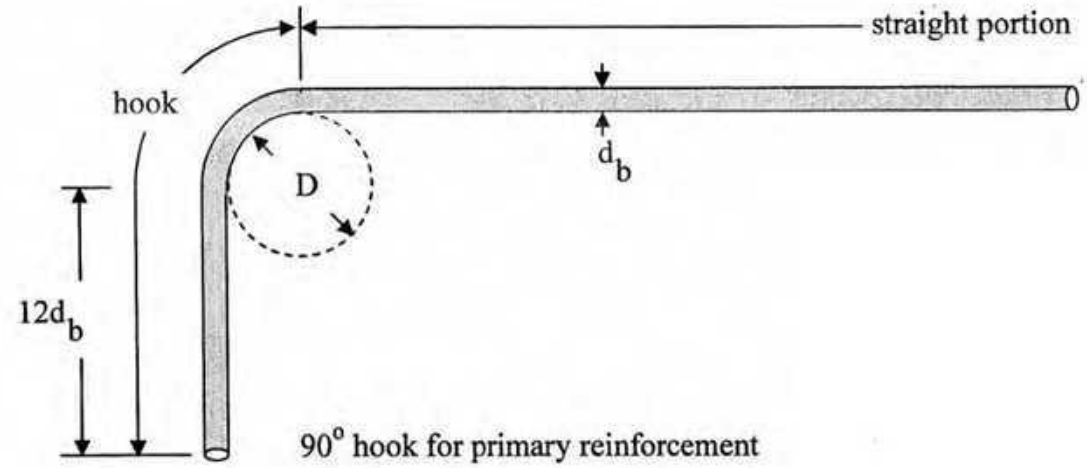
Bar size	for 90° hooks		for 180° hooks
	Diameter of bend (D)		Diameter of bend (D)
	f_y = 40000 psi	f_y > 40000 psi	(for all values of f_y)
# 3 to # 8	$5d_b$	$6d_b$	$6d_b$
# 9	$5d_b$	$8d_b$	$8d_b$
# 10	$5d_b$	$8d_b$	$8d_b$
# 11	$5d_b$	$8d_b$	$8d_b$
# 14	.....	$10d_b$	$10d_b$
# 18	.....	$18d_b$	$18d_b$

* d_b = bar diameter

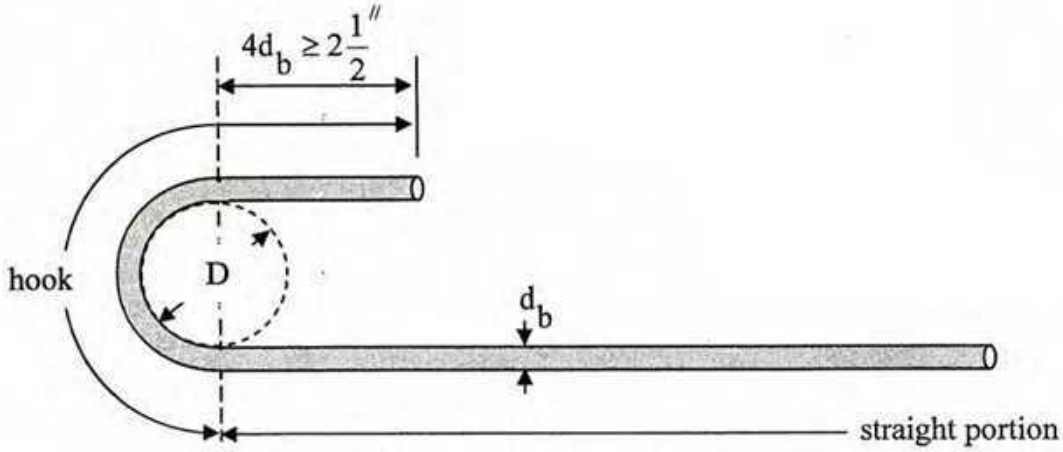
Table 6: ξ values

Bar number	f_y = 60000 psi		f_y = 40000 psi
	Top bars	Other bars	All bars
# 3, # 4 and # 5	540	540	360
# 6	450	540	360
# 7 and # 8	360	540	360
# 10	360	480	360
# 11	360	420	360
# 14	330	330	330
# 15	220	220	220

* $f_h = \xi\sqrt{f'_c}$; f_h = tensile force in hook



90° hook for primary reinforcement



180° hook for primary reinforcement

Table 7: lap splice requirements for deformed bar in tension

$\frac{A_{s(supplied)}}{A_{s(required)}}$	Minimum percent of A_s spliced within the required lap length		
	50%	75%	100%
≥2	$l_s = 1.0\ l_d$ (Class A)	$l_s = 1.0\ l_d$ (Class A)	$l_s = 1.3\ l_d$ (Class B)
<2	$l_s = 1.3\ l_d$ (Class B)	$l_s = 1.7\ l_d$ (Class C)	$l_s = 1.7\ l_d$ (Class C)

* $l_s > l_d$; l_s = splice length in tension & l_d = development length in tension

* splice length (l_s) in tension should not less than 12 inch

Table 8: lap splice requirements for deformed bar in compression

	l_s	
	$f'_c \geq 3000$ psi	$f'_c < 3000$ psi
$f_y = 40000$ psi	$20\ d_b$	$26.67\ d_b$
$f_y = 60000$ psi	$30\ d_b$	$40\ d_b$
$f_y = 75000$ psi	$44\ d_b$	$58.67\ d_b$

* $l_s > l_d$; l_s = splice length in compression & l_d = development length in compression

Reinforcement in a compression member confined with ties (effective area of ties $\geq 0.0015bs$; b = column dimension in inch & s = spacing of ties in inch)	$0.83\ l_d$
Reinforcement in a compression member confined with continuous spirals	$0.75\ l_d$

* splice length (l_s) in compression should not less than 12 inch

Table 9: Temperature & shrinkage reinforcement

Types of bar	Temperature & shrinkage reinforcement ($inch^2$/feet)
Slabs where plain bars are used	0.0025 b t
Slabs where deformed bars with specified yield strengths less than 60,000 psi (40 grade or 50 grade) are used	0.0020 b t
Slabs where deformed bar with 60,000 specified yield strengths or welded wire fabric (smooth or deformed) are used	0.0018 b t

Table 10: Minimum thickness of one-way slab as per ACI code.

Types of one-way slab	Minimum thickness (inch)
Simply supported	$\frac{L_n}{20}\left(0.4+\frac{f_y}{100000}\right)$
One – end continuous	$\frac{L_n}{24}\left(0.4+\frac{f_y}{100000}\right)$
Both – end continuous	$\frac{L_n}{28}\left(0.4+\frac{f_y}{100000}\right)$
Cantilever	$\frac{L_n}{10}\left(0.4+\frac{f_y}{100000}\right)$

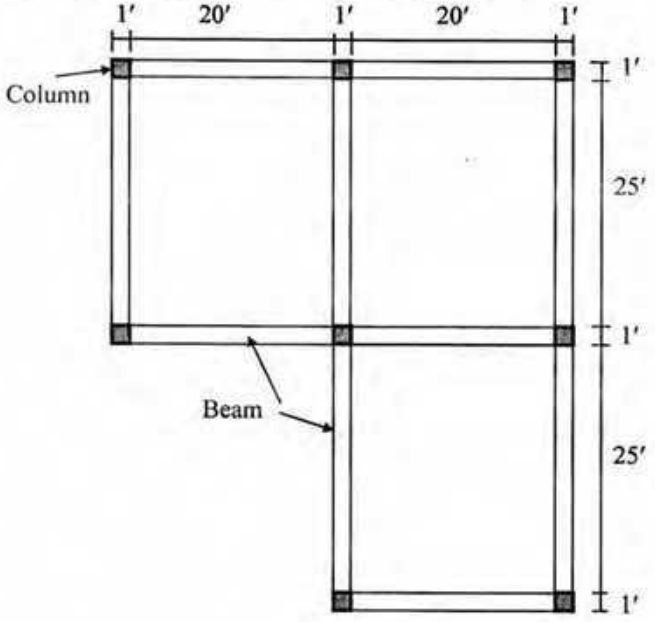
[For Section A only]

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B. Sc Engineering (Civil)

Course Title: Design of Concrete Structures II | Course Code: CE 317
Time: 3.00 Hours | Full Marks: 150

[Answer **any 6 (six)** of the following 8 questions]

1. Refer to the following slab system of a three-storied building: (25)



LL = 60 psf, partition wall = 50 psf, floor finish = 20 psf, f'_c = 3 ksi, f_y=40 ksi, f_s = 20 ksi, j=0.874, R=223 psi.

Design the slab by WSD. Follow the steps mentioned below:

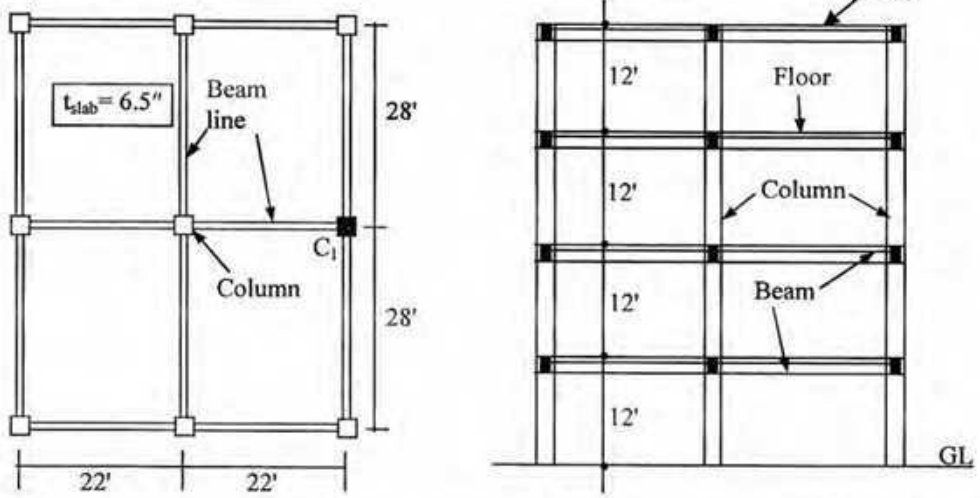
(i) Calculation for minimum slab thickness
(ii) Determination of moment coefficients and calculation for design moments
(iii) Check for slab thickness to avoid compression failure of concrete
(iv) Calculation for flexural reinforcements
(v) Check for temperature and shrinkage reinforcements
(vi) Neat sketches of reinforcements (including corner reinforcement) (plan and one section)

Tables for moment coefficients are attached.

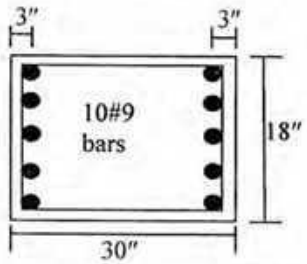
2. A plan and section of a 4 storied building on beams and columns are shown in figure below. All the beams in all floors are 12"x 24" including slab. (25)

Column sections proposed to be 24"x24"
Lime concrete on roof = 25 psf
Floor finish on each floor = 30 psf
Random wall load on each floor = 30 psf
Live load on each floor = 60 psf
Live load on roof = 20 psf
Material specification: f'_c= 3 ksi, f_y= 60 ksi, f_s= 24 ksi, n= 9, k= 0.38, j= 0.874

Design the edge column C_1 (assuming no bending moment) in both USD and WSD and compare the results.

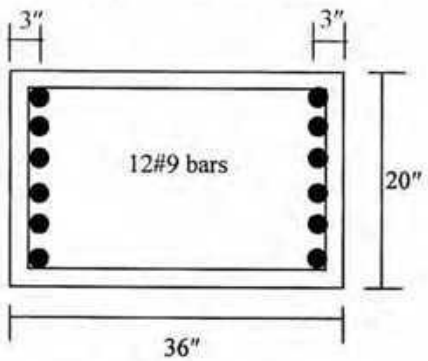


3.(a) Using the interaction diagram, determine the value of P_n and M_n for the short tied column shown in figure below. Given that, e=18", f'_c = 4 ksi, f_y = 60 ksi. (06)



(b) Design a spiral column (also spirals) for DL=1200^k and LL=700^k. Assume ρ_g = 3.5% (10)
Given, f'_c = 4 ksi, f_y = 60 ksi. Use USD method.

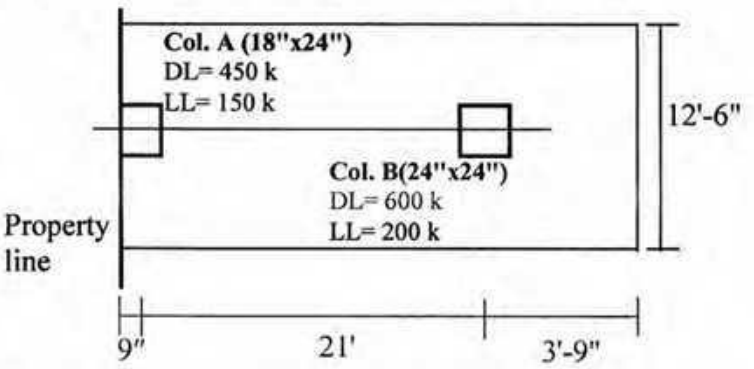
(c) For the column shown below, calculate the corresponding moment for P= 250 ^{k} by WSD. (09)
Given that, f'_c= 3 ksi, f_y = 60 ksi, f_s= 20 ksi, S_{ut}=6870 in^3.



4.(a) A combined footing supporting two columns A and B (with working loads as given) is shown in figure below. Depth of the footing is 47". (17)

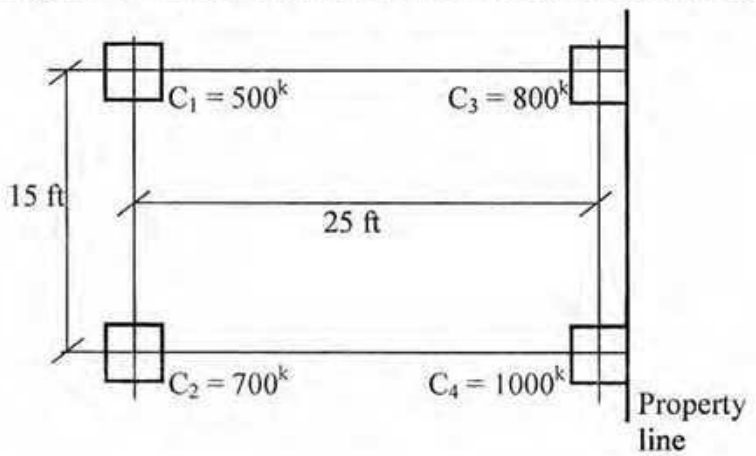
a) Check the adequacy against punching shear under column C_1 and C_2
b) Design the transverse beams under the column C_1 and C_2
c) Show all the reinforcements in a section (both designed transverse and qualitative longitudinal reinforcement)

Given, f'_c= 3 ksi, f_y = 60 ksi, f_s= 24 ksi, j=0.88. Use WSD.



(b) Design a wall footing to support a 12 in wide reinforced concrete wall with a dead load 20 k/ft and a live load 15 k/ft. Use USD. [Given: Allowable soil bearing capacity = 3.5 ksf, f_y= 60 ksi ,f'_c= 4 ksi and R=937 psi] (08)

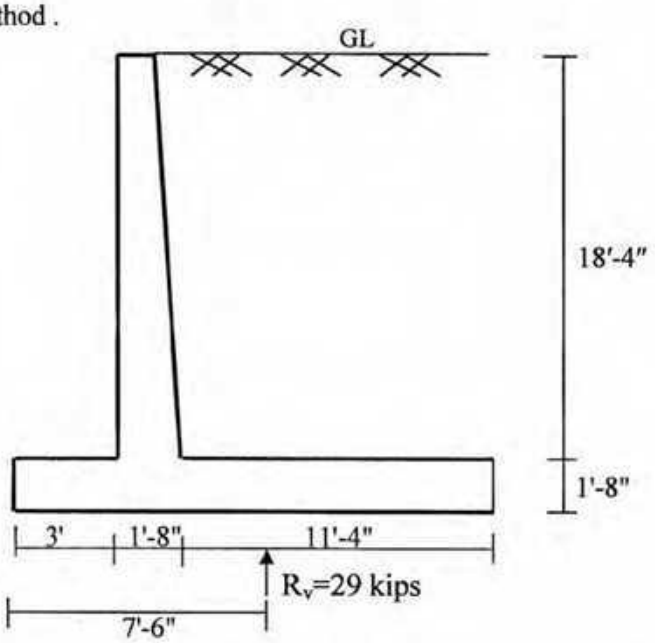
5.(a) The part plan of a structure as shown in Figure below consists of column C_1, C_2, C_3 and C_4 carrying axial loads of 500^k, 700^k, 800^k and 1000^k respectively. If the allowable bearing capacity of the soil is 5 ksf and all the columns are 24" x 24", calculate the area of the combined footing and show all the columns and dimensions in a combined footing layout. (10)



(b) An interior column of a building carries total service DL= 245 kip and LL=200 kip. The column is 18" x 18". The column is supported on a footing having width = 8.5' and depth=23". Design the rectangular footing and show the reinforcements in plan and section with neat sketches. Given, allowable soil bearing pressure is 5 ksf [Given f'_c= 4 ksi ,f_y = 60 ksi, j=0.866]. Use WSD method. (15)

6(a) A cross section of a retaining wall is shown in the following figure. If R_v, the vertical component of the reaction is equal to 29 kips and acts at a distance 7.5 ft from the toe as shown. Design the footing (heel slab and toe slab) of the retaining wall [Given: γ_s=100 lb/ft^3, f_c'=3 ksi, f_s=24 ksi, k=0.37, j=0.874]. (12)

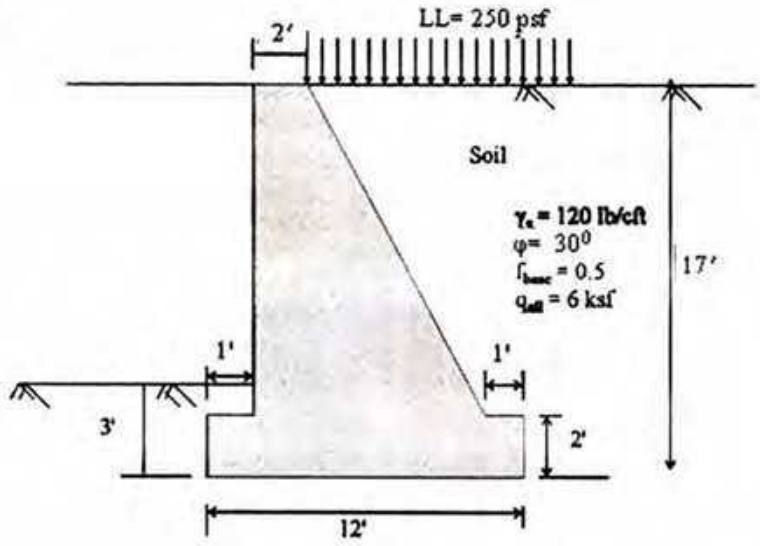
Use WSD method .



(b) A trial section of a gravity retaining wall as shown in the following figure was planned to support the soil behind the wall and the surcharge on the ground surface. (10)

i) Check the external stability of the section against sliding and overturning.
ii) Also check the soil pressure under the base.

[Consider only the critical position of surcharge LL.]



(c) What are the stability checks for retaining walls? Discuss the importance of it. (3)

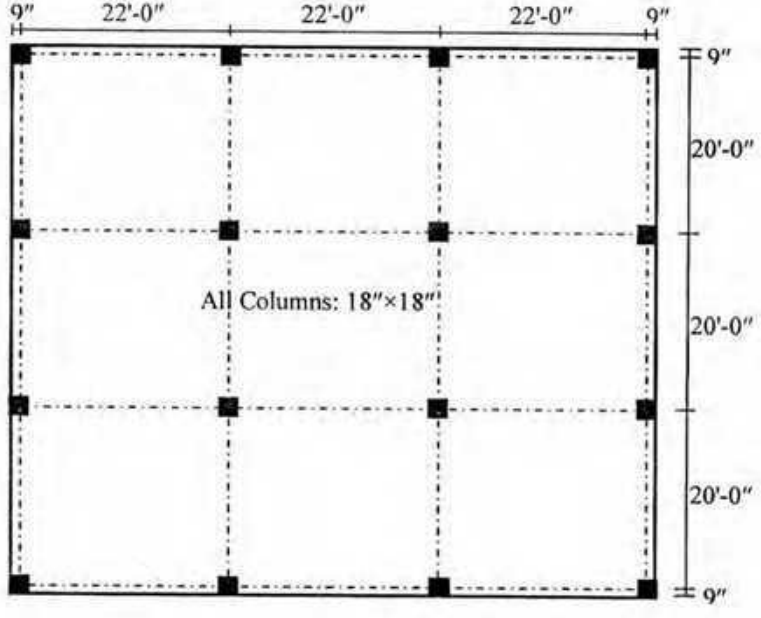
7. An office building is planned using a flat plate floor system with the column layout as shown in the following figure. No beams, drop panels or column capitals are permitted. The columns are 18 inch square and floor to floor height of the building is 12.0 ft. Other design conditions and material properties are given below: (25)

FF=20 psf, Partition wall load = 30 psf and LL=100 psf, f_y = 60 ksi, f_c' = 4.0 ksi.

Design an interior panel by **USD**.

Follow the steps mentioned below:

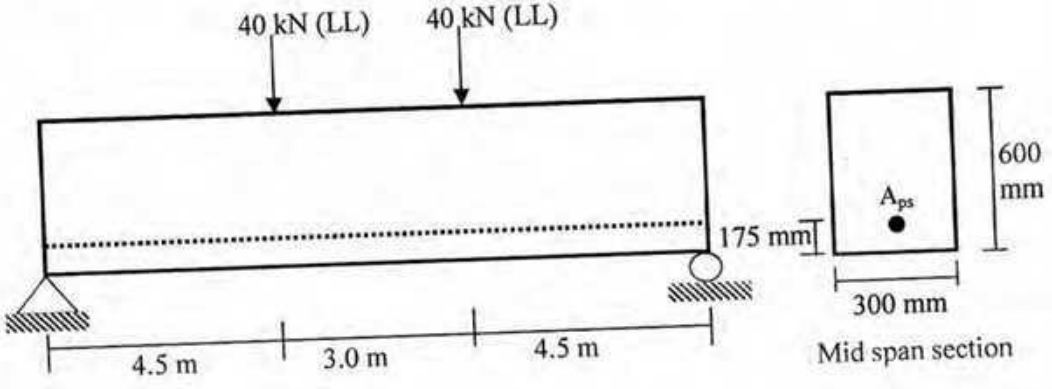
(i) Calculation for minimum slab thickness
(ii) Check for punching shear – around interior column
(iii) Calculation for design moments
(iv) Check for slab thickness – moment consideration
(v) Calculation for flexural reinforcements
(vi) Neat sketches for reinforcements (in long direction only)



8(a). What is the basic difference between the internal couple of a prestressed and of a reinforced concrete beam section? (05)

(b). A pre tensioned concrete beam has a prestress of 1580 kN in the steel immediately after prestressing and reduces to 1370 kN due to losses. In addition to live loads shown in the figure, it has a self weight of 4.5 kN/m.Compute the extreme fibre stresses at midspan for the following conditions: (10)

i) at initial condition with full prestress and no live load
ii) at working condition with effective prestress and full live loads.



(c) For the beam in Question 8(b) , compute the total load (dead and live) that can be carried by the beam for the following conditions: (10)

(i) zero tensile stress in the bottom fibre
(ii) cracking in the bottom fibres at a modulus of rupture of 4.0 MPa, and assuming concrete will take tension up to that value only.

6.5.2 **Scope and Limitations**

6.5.2.1 The provisions of this section may be used as alternative to those of Sec 6.4 for two-way slabs supported on all four edges by walls, steel beams or monolithic concrete beams having a total depth not less than 3 times the slab thickness.

6.5.2.2 Panels shall be rectangular with a ratio of longer to shorter span centre to centre of supports not greater than 2.

6.5.2.3 The value of $(\alpha_1 \ell_2/\ell_1)$ shall be greater than or equal to 1.

6.5.3 **Analysis by the Coefficient Method**

6.5.3.1 The negative moments and dead load and live load positive moments in the two directions shall be computed from Tables 6.6.11, 6.6.12 and 6.6.13 respectively. Shear in the slab and loads on the supporting beams shall be computed from Table 6.6.14.

6.5.4 **Shear on Supporting Beam**

The shear requirements provided in Sec 6.4.7.6 shall be satisfied.

6.5.5 **Deflection**

Thickness of slabs supported on walls or stiff beams on all sides shall satisfy the requirements of Sec 6.4.3.1 (b) and (c).

Table 6.6.11
Coefficients for Negative Moments in Slabs †

$M_{a,neg} = C_{a,neg} w \ell_a^2$

$M_{b,neg} = C_{b,neg} w \ell_b^2$ where w = total uniform dead plus live load per unit area

Ratio $m = \frac{\ell_a}{\ell_b}$		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9
1.00	$C_{a,neg}$		0.045		0.050	0.075	0.071		0.033	0.061
	$C_{b,neg}$		0.045	0.076	0.050			0.071	0.061	0.033
0.95	$C_{a,neg}$		0.050		0.055	0.079	0.075		0.038	0.065
	$C_{b,neg}$		0.041	0.072	0.045			0.067	0.056	0.029
0.90	$C_{a,neg}$		0.055		0.060	0.080	0.079		0.043	0.068
	$C_{b,neg}$		0.037	0.070	0.040			0.062	0.052	0.025
0.85	$C_{a,neg}$		0.060		0.066	0.082	0.083		0.049	0.072
	$C_{b,neg}$		0.031	0.065	0.034			0.057	0.046	0.021
0.80	$C_{a,neg}$		0.065		0.071	0.083	0.086		0.055	0.075
	$C_{b,neg}$		0.027	0.061	0.029			0.051	0.041	0.017
0.75	$C_{a,neg}$		0.069		0.076	0.085	0.088		0.061	0.078
	$C_{b,neg}$		0.022	0.056	0.024			0.044	0.036	0.014
0.70	$C_{a,neg}$		0.074		0.081	0.086	0.091		0.068	0.081
	$C_{b,neg}$		0.017	0.050	0.019			0.038	0.029	0.011
0.65	$C_{a,neg}$		0.077		0.085	0.087	0.093		0.074	0.083
	$C_{b,neg}$		0.014	0.043	0.015			0.031	0.024	0.008
0.60	$C_{a,neg}$		0.081		0.089	0.088	0.095		0.080	0.085
	$C_{b,neg}$		0.010	0.035	0.011			0.024	0.018	0.006
0.55	$C_{a,neg}$		0.084		0.092	0.089	0.096		0.085	0.086
	$C_{b,neg}$		0.007	0.028	0.008			0.019	0.014	0.005
0.50	$C_{a,neg}$		0.086		0.094	0.090	0.097		0.089	0.088
	$C_{b,neg}$		0.006	0.022	0.006			0.014	0.010	0.003

† A crosshatched edge indicates that the slab continues across, or is fixed at the support; an unmarked edge indicates a support at which torsional resistance is negligible.

CE317/2

Table 6.6.12
Coefficients for Dead Load Positive Moments in Slabs †

$M_{a,pos,dl} = C_{a,dl} w \ell_a^2$

$M_{b,pos,dl} = C_{b,dl} w \ell_b^2$ where w = uniform dead load per unit area

Ratio $m = \frac{\ell_a}{\ell_b}$		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9
1.00	$C_{a,dl}$	0.036	0.018	0.018	0.027	0.027	0.033	0.027	0.020	0.023
	$C_{b,dl}$	0.036	0.018	0.027	0.027	0.018	0.027	0.033	0.023	0.020
0.95	$C_{a,dl}$	0.040	0.020	0.021	0.030	0.028	0.036	0.031	0.022	0.024
	$C_{b,dl}$	0.033	0.016	0.025	0.024	0.015	0.024	0.031	0.021	0.017
0.90	$C_{a,dl}$	0.045	0.022	0.025	0.033	0.029	0.039	0.035	0.025	0.026
	$C_{b,dl}$	0.029	0.014	0.024	0.022	0.013	0.021	0.028	0.019	0.015
0.85	$C_{a,dl}$	0.050	0.024	0.029	0.036	0.031	0.042	0.040	0.029	0.028
	$C_{b,dl}$	0.026	0.012	0.022	0.019	0.011	0.017	0.025	0.017	0.013
0.80	$C_{a,dl}$	0.056	0.026	0.034	0.039	0.032	0.045	0.045	0.032	0.029
	$C_{b,dl}$	0.023	0.011	0.020	0.016	0.009	0.015	0.022	0.015	0.010
0.75	$C_{a,dl}$	0.061	0.028	0.040	0.043	0.033	0.048	0.051	0.036	0.031
	$C_{b,dl}$	0.019	0.009	0.018	0.013	0.007	0.012	0.020	0.013	0.007
0.70	$C_{a,dl}$	0.068	0.030	0.046	0.046	0.035	0.051	0.058	0.040	0.033
	$C_{b,dl}$	0.016	0.007	0.016	0.011	0.005	0.009	0.017	0.011	0.006
0.65	$C_{a,dl}$	0.074	0.032	0.054	0.050	0.036	0.054	0.065	0.044	0.034
	$C_{b,dl}$	0.013	0.006	0.014	0.009	0.004	0.007	0.014	0.009	0.005
0.60	$C_{a,dl}$	0.081	0.034	0.062	0.053	0.037	0.056	0.073	0.048	0.036
	$C_{b,dl}$	0.010	0.004	0.011	0.007	0.003	0.006	0.012	0.007	0.004
0.55	$C_{a,dl}$	0.088	0.035	0.071	0.056	0.038	0.058	0.081	0.052	0.037
	$C_{b,dl}$	0.008	0.003	0.009	0.005	0.002	0.004	0.009	0.005	0.003
0.50	$C_{a,dl}$	0.095	0.037	0.080	0.059	0.039	0.061	0.089	0.056	0.038
	$C_{b,dl}$	0.006	0.002	0.007	0.004	0.001	0.003	0.007	0.004	0.002

† A crosshatched edge indicates that the slab continues across, or is fixed at the support; an unmarked edge indicates a support at which torsional resistance is negligible.

Table 6.6.13
Coefficients for Live Load Positive Moments in Slabs †

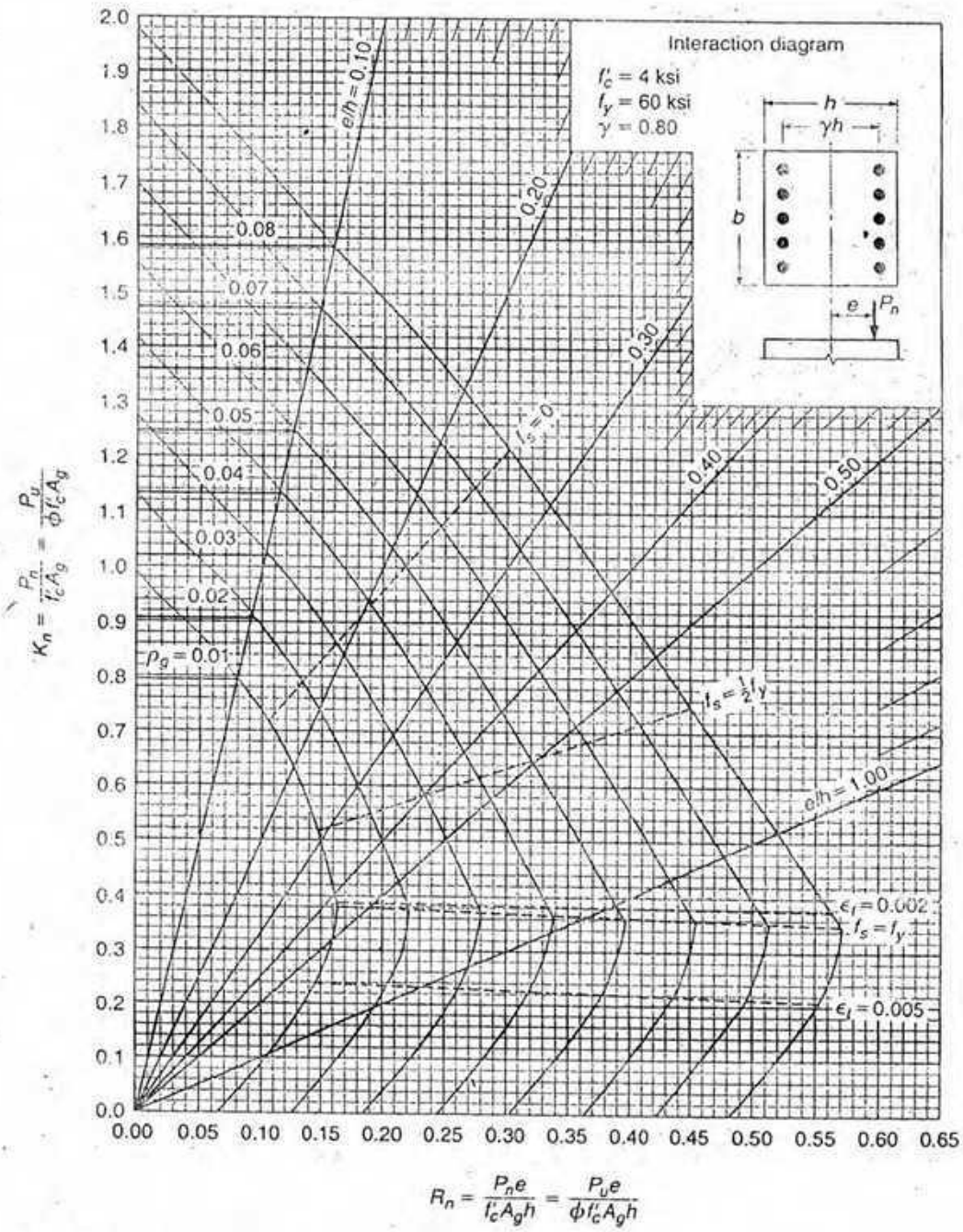
$M_{a,\text{pos},ll} = C_{a,ll} w \ell_a^2$

$M_{b,\text{pos},ll} = C_{b,ll} w \ell_b^2$ where w = uniform live load per unit area

Ratio $m = \frac{\ell_a}{\ell_b}$		Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9
1.00	$C_{a,ll}$	0.036	0.027	0.027	0.032	0.032	0.035	0.032	0.028	0.030
	$C_{b,ll}$	0.036	0.027	0.032	0.032	0.027	0.032	0.035	0.030	0.028
0.95	$C_{a,ll}$	0.040	0.030	0.031	0.035	0.034	0.038	0.036	0.031	0.032
	$C_{b,ll}$	0.033	0.025	0.029	0.029	0.024	0.029	0.032	0.027	0.025
0.90	$C_{a,ll}$	0.045	0.034	0.035	0.039	0.037	0.042	0.040	0.035	0.036
	$C_{b,ll}$	0.029	0.022	0.027	0.026	0.021	0.025	0.029	0.024	0.022
0.85	$C_{a,ll}$	0.050	0.037	0.040	0.043	0.041	0.046	0.045	0.040	0.039
	$C_{b,ll}$	0.026	0.019	0.024	0.023	0.019	0.022	0.026	0.022	0.020
0.80	$C_{a,ll}$	0.056	0.041	0.045	0.048	0.044	0.051	0.051	0.044	0.042
	$C_{b,ll}$	0.023	0.017	0.022	0.020	0.016	0.019	0.023	0.019	0.017
0.75	$C_{a,ll}$	0.061	0.045	0.051	0.052	0.047	0.055	0.056	0.049	0.046
	$C_{b,ll}$	0.019	0.014	0.019	0.016	0.013	0.016	0.020	0.016	0.013
0.70	$C_{a,ll}$	0.068	0.049	0.057	0.057	0.051	0.060	0.063	0.054	0.050
	$C_{b,ll}$	0.016	0.012	0.016	0.014	0.011	0.013	0.017	0.014	0.011
0.65	$C_{a,ll}$	0.074	0.053	0.064	0.062	0.055	0.064	0.070	0.059	0.054
	$C_{b,ll}$	0.013	0.010	0.014	0.011	0.009	0.010	0.014	0.011	0.009
0.60	$C_{a,ll}$	0.081	0.058	0.071	0.067	0.059	0.068	0.077	0.065	0.059
	$C_{b,ll}$	0.010	0.007	0.011	0.009	0.007	0.008	0.011	0.009	0.007
0.55	$C_{a,ll}$	0.088	0.062	0.080	0.072	0.063	0.073	0.085	0.070	00.063
	$C_{b,ll}$	0.008	0.006	0.009	0.007	0.005	0.006	0.009	0.007	0.006
0.50	$C_{a,ll}$	0.095	0.066	0.088	0.077	0.067	0.078	0.092	0.076	0.067
	$C_{b,ll}$	0.006	0.004	0.007	0.005	0.004	0.005	0.007	0.005	0.004

† A crosshatched edge indicates that the slab continues across, or is fixed at the support; an unmarked edge indicates a support at which torsional resistance is negligible.

CE 317/4



GRAPH A.11

Column strength interaction diagram for rectangular section with bars on end faces and $\gamma = 0.80$ (for instructional use only).

CE 317/5

Formulas related to pressure at heel and toe

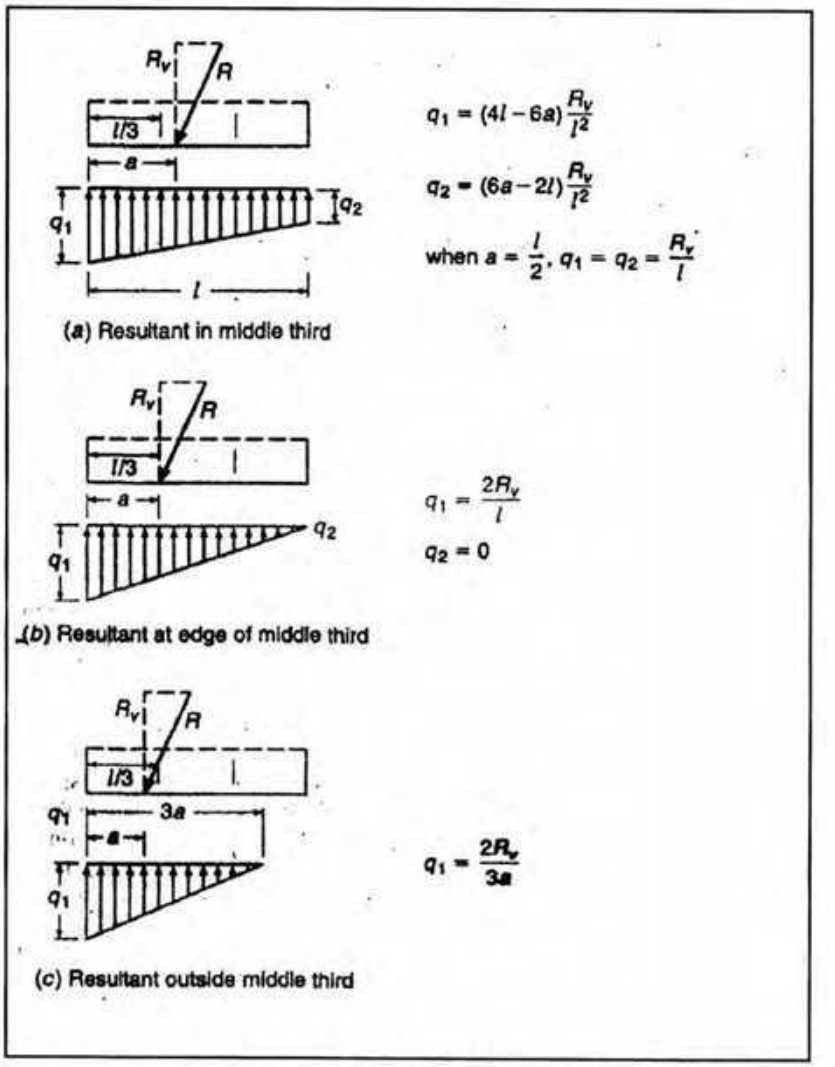


Table: Column Strip Moment, Percent of Total Moment at Critical Section

			L_2/L_1		
			0.5	1.0	2.0
Interior $M^{(-)}$	$\alpha_1 L_2/L_1=0$		75	75	75
	$\alpha_1 L_2/L_1\geq 1$		90	75	45
$M^{(+)}$	$\alpha_1 L_2/L_1=0$		60	60	60
	$\alpha_1 L_2/L_1\geq 1$		90	75	45
Exterior $M^{(-)}$	$\alpha_1 L_2/L_1=0$	$\beta_t=0$	100	100	100
		$\beta_t\geq 2.5$	75	75	75
	$\alpha_1 L_2/L_1\geq 1$	$\beta_t=0$	100	100	100
		$\beta_t\geq 2.5$	90	75	45

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B. Sc. Engineering (Civil)

Course Title: Environmental Engineering I — Course Code: CE 331
Time: 3 Hours — Full Marks: 150

Answer any **six** out of **eight** questions. The figures in the right margin indicate full marks.

1.a) What are the objectives of water supply system? Show the essential elements of a surface water based water supply system with a flow diagram. (07)

b) Enumerate the factors to be considered in planning a municipal water supply system? (08)

c) Discuss briefly the factors affecting water consumption. (10)

2.a) Write a note on 'fluctuations in the rate of water consumption'; explaining its significance in the design of water works system. (08)

b) Estimate the future population of a city by the geometric increase method for the year 2025 and 2040 from the following data: (12)

Year	1940	1950	1960	1970	1980	1990	2000
Population	26000	28600	36800	44500	49950	58700	65200

Also calculate the fire demand for the population in 2040 by Kuichling's method.

c) Write a short note on provision for 'fire demand' in water supply. (05)

3.a) Briefly explain the problems in ground water development in Bangladesh. (09)

b) How will you test the soundness of your construction before bringing a pipeline into commission? (06)

c) The velocity of water flowing from a reservoir into a 1 m diameter steel pipe is 2.5 m/s. If a valve is situated in the pipe line at a point 2.8 km from the reservoir, evaluate water hammer pressure developed by the closure of this valve, if (10)
   a) the closure time is 3 sec
   b) the closure time is 6 sec
Take pipe shell thickness = 2.5 cm, $E_w = 21000$ kg/cm^2 and $E_p = 2100000$ kg/cm^2

4.a) What are the steps involved in the design of tube wells? What are the reasons for failure of tubewells? (08)

b) Determine the diameter of a tube well for the following data: (10)
Yield = 0.21 cumec, thickness of the confined aquifer = 35 m, draw down = 6 m, radius of circle of influence = 315 m, coefficient of permeability = 60 m/d.

c) Differentiate between direct rotary method and reverse circulation method of drilling deep tubewells. (07)

5.a) What are the sanitary significances, WHO guideline values and Bangladesh standards of the following impurities in water: Arsenic, Iron and Lead. (09)

b) Design a rectangular settling basin for a flow of 4.5 MLD. The over-flow rate is 0.025 cm/s and the detention period is 2.5 h. Calculate the weir length required if the weir loading is 130 $m^3/d/m^2$. (10)

c) Define the following: i) Coagulation, ii) Flocculation, iii) Disinfection. (06)

6.a) Briefly explain the theories of filtration. (08)

b) Explain the process of arsenic removal by the method of co-precipitation and adsorption indicating the possible chemical reactions involved. (10)

c) It is required to supply water to a population of 50,000 at a per capita demand of 150 litres per day. The disinfectant used for chlorination is bleaching powder which contains 30% available chlorine. Determine how much of bleaching powder is required monthly at the water works if 0.3 ppm of chlorine dose is required for disinfection. (07)

7.a) Write the advantages and disadvantages of branched and looped distribution networks. (08)

b) How can you calculate the flow in a looped network using Hardy Cross method? (07)

c) Water has to be supplied to a town with 15 million populations at the rate of 150 lpcd from a river 2.5 km away. The difference in elevation between the L.W.L in the sump and reservoir is 36 m. If the demand has to be supplied in 8 hours, determine the size of the main and the B.H.P. of the pumps required. Assume maximum demand as 1.5 times the average demand, f = 0.0075, velocity in the pipe 2.4 m/sec, and efficiency of pump 80 percent. (10)

8.a) Why is the Tara hand pump tube well developed and being prompted in Bangladesh? (05)

b) What are the advantages and disadvantages of rainwater harvesting in Bangladesh? (08)

c) Write short notes on any three of the following: (12)

i) Water use and re-use
ii) Ethics of water
iii) Water pricing
iv) Basic requirements for community management in WSS project

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B.Sc. Engineering (Civil)

Course Title: Environmental Engineering II — Course Code: CE 333
Time: 3.0 hrs — Full Marks: 150

There are **EIGHT** questions. Answer any **SIX.**
[Assume reasonable value for missing data (if any)]

1.a) What are the major functions of a sanitary system? (3)

b) Describe the measures or design modifications taken to prevent or reduce ground water contamination from pour-flush pit latrine in high water table area. (5)

c) Design a circular simple pit latrine for a family of five members. The soil in the area is fairly permeable and stable. The groundwater table is 5m below the ground level. The latrine is to be designed for a period of four years. The family uses water for personal hygiene. (12)

d) If the soil is sandy loam with a long-term infiltration rate of about 30 l/m^2/day. Design a soakage pit for a septic discharging 900 litre effluent every day. (5)
(Assume pit dia=1.25 m)

2.a) Differentiate in between the following (8)
(i) Peak dry weather flow and Peak wet weather flow
(ii) AADT and ADT

b) List the salient features of Hydraulic element diagram. (6)

c) Define self cleansing velocity. Why there is a maximum limiting velocity specified in designing sanitary sewer system? (4)

d) What basic concept should we follow for laying out manhole? (5)

e) Which type of sewer system would you suggest in case of a densely populated low-income community? Justify your answer. (2)

3.a) Show the pattern of pollution and self purification of a stream and its effect on biological life in a curve and briefly discuss each zone. (10)

b) Design a waste stabilization pond system to treat wastewater from a residential area with a population of 50000. The average wastewater flow is about 100 l/person/day and the BOD contribution is 40 gm/person/day. The average temperature of the month December is 23°C. Assume the fecal coliform concentrations of raw and treated wastewater are 1.18×10^8 and 1000 per 100 ml respectively. Assume $k_{20°C} = 0.3\ d^{-1}$ and $k_{b20°C} = 0.7\ d^{-1}$. (15)

4.a) Draw the bacteria-algae symbiosis in waste stabilization pond. Show that maximum efficiency in a series of waste stabilization ponds is achieved when the detention times of all ponds are the same. (10)

b) What do you mean by the following terms: (15)
i) Grit Chamber
ii) Sludge Volume Index
iii) Invert level of sewer
iv) Self-cleansing velocity
v) Anaerobic process

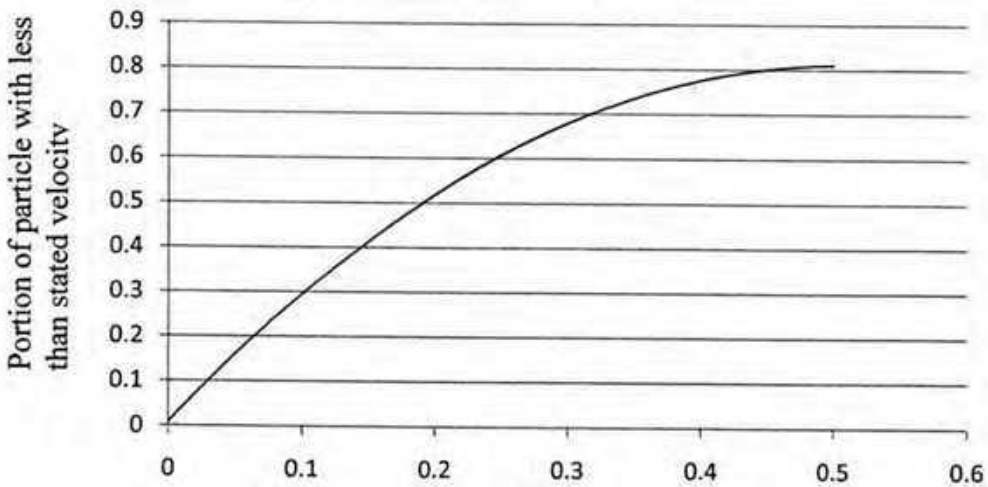
5.a) What are the dewatering processes? (3)

b) What do you understand by discrete settling? (2)

c) The settling characteristics of a suspension at 2 ft depth are as follows: (17)

Time (min)	00	05	10	20	40	60
S.S. (mg/L)	250	210	156	90	50	40

Figure: Settling Characteristic Curve



Calculate the efficiency of the sedimentation basin when Q = 1.5 cfs and A = 360 ft^2.

d) Write down the steps is sewage treatment. (3)

6.a) Mention the processes to improve dewater ability of sludge. (4)

b) Draw "dissolve oxygen sag curve" and explain the terms in this curve. (5)

c) Briefly discuss the sludge digestion process. (8)

d) A 4.5 ft deep, 0.5 acre trickling filter has been constructed to treat 1.5 mgd of sewage having a BOD_5 of 230 mg/L from a small town. Calculate the efficiency of the filter by NRC (USA) formula, when the recirculation ratio is 0.5. Also calculate BOD loading of the filter. (8)

7.a) Briefly discuss the various growth phase of bacteria with neat diagram. (8)

b) A city discharges 1.55 m^3/s of sewage into a stream whose minimum flow is 8.5 m^3/s and velocity 3.2 km/h. The temperature of the sewage is 20°C and that of the water of stream is 12°C. The 20°C BOD_5 of the sewage is 180 mg/l and that of the stream water is 1.5 mg/l. The sewage contains no DO while the stream is 92% saturated with dissolved oxygen. The values of K_1 and K_2 at 20°C are 0.3/d and 0.7/d respectively. Use the temperature coefficient of 1.135 for K_1 and 1.024 for K_2. (17)

Determine -

(i) The critical oxygen deficit, critical (minimum) DO concentration and its location.

(ii) The DO at 100 and 150 km downstream from the point of discharge of sewage.

8.a) What are the methods of disposal of sewage effluent on land by irrigation? What are the advantages of the effluent disposal by irrigation? (10)

b) Draw a sectional view of a typical sludge digestion tank. (2)

c) What are the purposes of sludge digestion? (5)

d) Why temperature is considered as an important parameter in determining BOD? (2)

e) The 5 days BOD of sewage is 289 mg/l. Calculate the BOD reaction rate constant at 20°C. Ultimate BOD is 378 mg/l. Temperature is 23°C. (6)

Formulae:

1. $Q = A_i I$

2. $V_i = A_i \frac{D}{4}$

3. $\lambda_s = 10\ L_i\ Q / A$

4. $\lambda_v = L_i / t$

5. $A\ D = Q\ t$

6. $L_e = \frac{L_i}{(1+kt_1)(1+kt_2)....(1+kt_n)}$

7. $N_e = \frac{N_i}{(1+k_b t_1)(1+k_b t_2)....(1+k_b t_n)}$

8. $D_t = \frac{K_1 L_a}{K_2 - K_1}\left(e^{-K_1 t} - e^{-K_2 t}\right) + D_a . e^{-K_2 t}$

9. $t_c = \frac{1}{K_2 - K_1} \ln\left\{\frac{K_2}{K_1}\left(1 - \frac{D_a(K_2 - K_1)}{K_1 L_a}\right)\right\}$

10. $D_c = \frac{K_1}{K_2} L_a . e^{-K_1 t_c}$

11. $k\ (T°C) = k\ (20°C) \times (1.04)^{T-20}$

12. $k_b\ (T°C) = k_b\ (20°C) \times (1.19)^{T-20}$

13. $Y_t = L\ (1 - 10^{k1t})$

14. $E_1 = 100 / \{1 + 0.0085 \sqrt{(W_1 / V_1 F_1)}\}$

15. $F_1 = (1+R_1) / (1+0.1R_1)^2$

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B.Sc. Engineering (Civil)

Course Title: Transportation Engineering- I
Time: 3 hrs

Course Code: CE 351
Full Marks: 150

There are **SEVEN** questions. Answer any **FIVE** questions.

1(a) Discuss the activities of different Ministries and related departments on transportation system operation and maintenance in our country. (18)

(b) Describe different constraints in the development of roads, waterways, railways and airways in Bangladesh. (12)

2(a) Explain briefly, the factors which influence the development of transportation. (15)

(b) How are roads in Bangladesh classified? Describe the features of different classes of roads. (15)

3(a) What are the advantages and disadvantages of a rotary intersection? (8)

(b) What are the main objectives of Traffic Engineering? What is guardrail? When do we need to provide guard rails? (10)

(c) An urban central business street, with 70 ft pavement width having a reflectance of 10%, carries a maximum of 1300 vph at night time in both directions. Design lighting system of the road considering mercury light source with mounting height of 40 ft and a maintenance factor of 0.75. Draw the lighting layout. Necessary information are given in Tables 1 to 4 and in Figure 1. (10)

(d) What is "PIEV"? (2)

4(a) Write down the general requirements of traffic control devices. Name the functional classification of traffic signs and give two examples for each. (10)

(b) Design a two-phase traffic signal for an isolated intersection. The following data are given: (10)

Inter- green period= 9 sec for N- S phase
6 sec for E- W phase
Initial and final lost time= 3 sec for N-S phase
2 sec for E- W phase

Amber period= 3 sec
Red- Amber= 2 sec

Approach	North	South	East	West
Arrival Flow(pcu/hr)	800	400	700	650
Saturation Flow(pcu/hr)	2000	1800	2200	2100

Draw the cycle time bar diagram

(c) What regulations are needed to ensure proper functioning and effective use of a terminal? (5)

(d) Where are the grade separations and interchanges required? (5)

5) (a) Define stopping sight distance(SSD) and passing sight distance(PSD). (5)

(b) Draw the flowchart of systematic approach of transportation planning. (10)

(c) Briefly differentiate between (i) Time-mean speed and Space-mean speed (ii) Pre-timed signal and vehicle-actuated signal.(iii) Parallel parking and angular parking (15)

6) (a) Following data was collected while conducting spot speed studies at certain stretch of a road within the urban area. (15)

Speed range(kmph)	Frequency(f)
0-5	0
5-10	10
10-15	20
15-20	40
20-25	110
25-30	200
30-35	250
35-40	120
40-45	40
45-50	20
50-55	10
55-60	7
60-65	3
65-70	0

Determine: i) Average speed of traffic stream
ii) Modal speed and pace of traffic stream
iii) Upper and lower speed limits
iv) Design speed

(b) Show diagrammatically the distances d1, d2, d3 and d4 in the calculation of minimum passing sight distance for a two-way straight highway. Consider right hand drive vehicle and keep to the left convension. Also write the required formula for calculation. (10)

(c) Define the following: (5)

(i) Design speed (ii) Design designation

7)a) A driver , moving at a speed of 65 mph on a 3% upgrade section of a highway, sights an obstruction 500 ft away and applied brake immediately. If the coefficient of friction for the pavement is 0.29, would the driver be able to stop the car before hitting the obstruction? (10)

TABLE 1 RECOMMENDED AVERAGE ILLUMINATION (LUMENS/FT^2)

Pedestrian traffic[1]	Vehicular traffic[2] (vph)			
	Very light (<150 vph)	Light (150 – 500 vph)	Medium (500 – 1,200 vph)	Heavy (>1,200 vph)
Heavy	-	0.8	1.0	1.2
Medium	-	0.6	0.8	1.0
Light	0.2	0.4	0.6	0.8

Notes:

(1) Heavy: As on main business street
Medium: As on secondary business streets
Light: As on local streets

(2) Night hour flow in both directions

TABLE 2 ADJUSTMENT FACTORS FOR RECOMMENDED AVERAGE ILLUMINATION VALUES

Surface Reflectance	Adjustment Factors
3 % or less	1.5
10%	1.0
20% or more	0.75

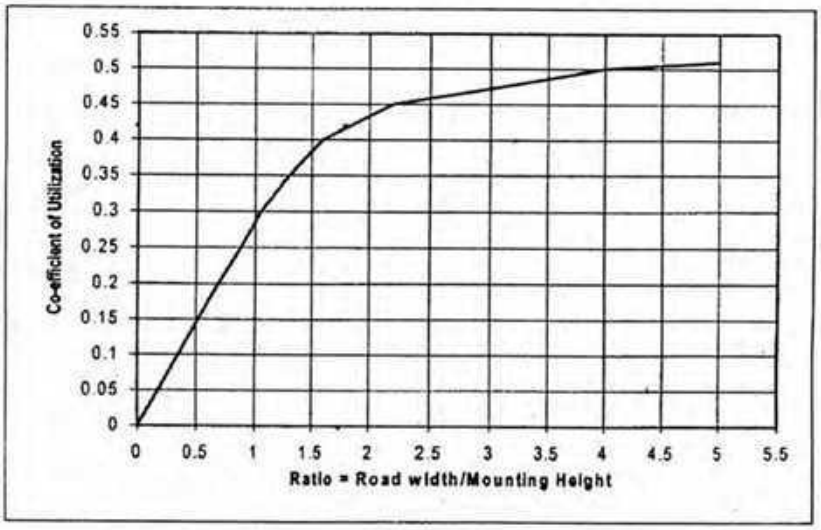
TABLE 3 LIGHTING SOURCE CHARACTERISTICS

Source Types	Expected Life (hrs)	Lighting Efficiency (Lumens/Watt)	Wattage (Watt)
Tungsten	1000	8 – 14	Up to 1000
Fluorescent	6000	50 – 75	Up to 250
Sodium	6000	100 – 120	Up to 160
Mercury	7500	20 – 60	Up to 400

TABLE 4 RECOMMENDED ARRANGEMENT OF STREET LIGHTING

Type of Arrangement	Pavement Width
One side	Width <= 30ft
Both sides – Staggered	30ft > Width <= 60ft
Both sides – Opposite	Width > 60ft

FIGURE 1 CO-EFFICIENT OF UTILIZATION CURVES (FOR LIGHT DISTRIBUTION TYPE III)



Note: Due to poor maintenance, the actual co-efficient of utilization is reduced by a factor usually 0.8 (i.e. taken as 80%).

b) Determine the rate of superelevation for a six degree circular curve with a design speed of 50 mph and a side-friction factor of 0.14. (5)

c) What is meant by "Level of Service (LOS)'? (3)

d) A minus 3.0 percent grade intersect a minus 0.9 percent grade at station 50+00 and at an elevation of 630 ft. Calculate the vertical curve elevations at stations 49+00 and 51+50 for a 500 ft vertical curve. Draw a neat sketch to show the given and calculated condition. (12)

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall- 2010
Program: B.Sc. Engineering (Civil)

Course Title: Open Channel Flow | Course Code: CE 361 | Credit: 3.00
Time: 3 hours | Full Marks: 150

Answer any **SIX** out of **EIGHT** Questions. The figures in the right margin indicate full marks.

1 a. Define: (i) Froude Number, and (ii) Reynolds Number 5

b. A trapezoidal channel has a bottom width of 6 m and side slopes of 2 (H):1 (V). Compute the discharge and determine the state of flow in this channel if the depth of flow is 1.5 m and the mean velocity of flow is 2.30 m/s. If elementary waves are created in this channel, determine the speed of the wave fronts upstream and downstream. 8

c. Why the velocity distribution in open channel flow is not uniform? 4

d. Find out the average velocity (u), kinetic energy correction factor (α) and momentum correction factor (β) for 2 m wide rectangular channel carrying water at 1 m depth. The equation of velocity distribution may be expressed as $u = 2y^2 + 3y + 5$. Where, y = depth of flow measured from the channel bottom. During calculation divide the depth of flow into five equal zones. 8

2 a Explain clearly what is meant by 'critical depth of flow' in a channel. Show that the critical depth (y_c) and velocity (V_c) for a rectangular channel can be expressed by $y_c = \sqrt[3]{\frac{q^2}{g}}$ and $V_c = \sqrt[3]{qg}$ respectively, where 'q' is the discharge per unit width and 'g' is the acceleration due to gravity. 6

b. A rectangular channel 3 m wide carries a uniform flow of water of 6 m^3/s. Plot the specific energy curve and determine the minimum specific energy and the critical depth from the plotted curve. 5

c. A trapezoidal channel having bed width 3 m and side slopes 1.5 vertical to 1 horizontal carries a discharge of 8 m^3/s. Calculate the critical depth and the corresponding specific energy. 6

d. A broad crested weir with an upstream square corner and spanning the full width of a rectangular canal of width 2.5 m is planned. The proposed crest length is 4.00 m and the crest elevation is 1.25 m above the bed. Calculate the water surface elevation upstream of the weir when the discharge is 5.0 m^3/s. 8

3 a. Explain why a uniform flow cannot occur (i) in a frictionless channel (ii) in a horizontal channel, and (iii) channel with adverse slope. 6

b. Mention the factors that affect Manning's roughness coefficient. 5

c. The sides of a laboratory flume are made of glass (n=0.010) and the bottom is made of wood (n=0.015). The flume is trapezoidal with b=2 m, side slope of 2H:1V and is laid on a slope of 0.001. Compute the discharge in the flume if depth of flow is 1.2 m. 5

d. A trapezoidal channel has a bottom width of 5.0 m, side slopes of 2:1, and n=0.02. 9
(i) Determine the normal slope at a normal depth of 1.0 m when the discharge is 10 m^3/s.
(ii) Determine the critical slope when the discharge is 10 m^3/s.
(iii) Determine the critical slope when the normal depth is 1 m.

4 a. What is a hydraulic jump? Define conjugate depths. 4

b. State the purposes of hydraulic jump. 5

c. Explain with neat sketches various types of hydraulic jumps. 8

d. A jump occurs in a channel of rectangular section 8.0 m wide in which the rate of flow is 24.00 m^3/s. If the depth of water before the jump occurs is 0.45 m, determine (i) type (ii) the depth after the jump has taken place (iii) length and (iv) head loss of the jump. 8

5 a. What is the necessity of transitions in open channels? Describe various types of transitions used in practice? 4

b. In a 4 m wide rectangular channel, water flows at a depth of 2 m and a velocity of 2.5 m/sec. The channel width is reduced to 2.5 m and the bottom elevation is raised by 30 cm at a particular section. Will the water elevation on the upstream be affected? If so, how much? 10

c. A sharp crested weir in a rectangular channel has a discharge 4 m^2/s per unit width as shown in the Figure 1. Estimate the energy loss due to the weir. Take $\alpha = 1.2$. 5

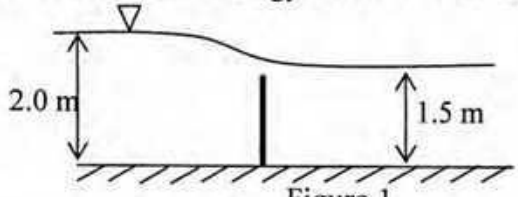


Figure 1

d. For the compound channel shown in Figure 2, determine the discharge if S=0.0002. 6

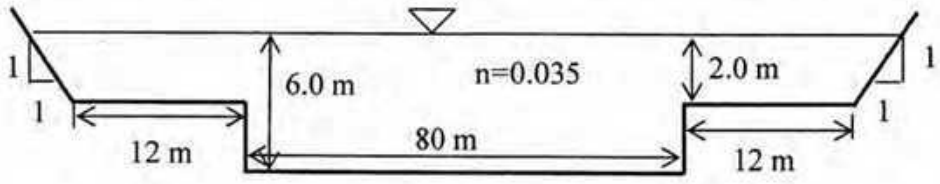


Figure 2

6 a. What do you mean by best hydraulic section? Using the best hydraulic section concept show that the hydraulic radius of a trapezoidal channel is half of the depth of flow. 8

b. An irrigation canal of trapezoidal section is to be built of smooth concrete (n=0.018). It has to carry 10 m^3/s at a bed slope of 1 in 5000. Find the most economical section. 5

c. Design a regime canal to carry 15 m^3/s using, 12
(i) Kennedy's equation. The permissible side slope is 0.5 H : 1V.
(Assume $S=8x10^{-5}$, n = 0.015 and m=0.85.)
(ii) Lacey's equation. The permissible side slope is 0.5 H : 1V.
(Assume mean sediment size of the sand is 0.6 mm)

7. a. What is free board? What are the purposes of providing free board? 3

b. What are the reasons for lining channels? 4

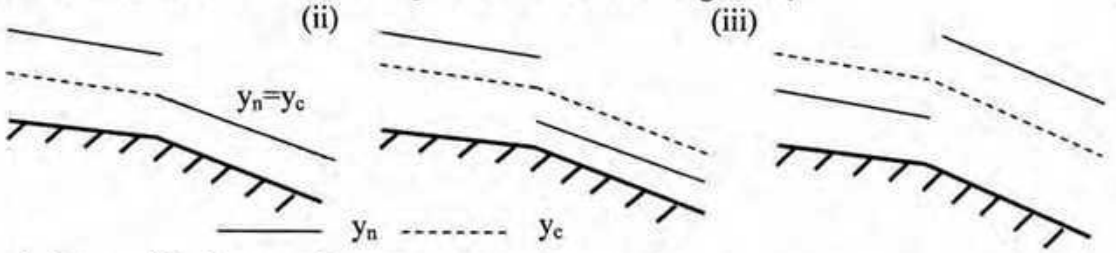
c. Define (a) Tractive force, and (b) Regime Channel 6

d. Design a canal to carry 60.00 m^3/s of clear water through 5.0 mm gravel (manning's roughness coefficient =0.015 and angle of Repose 36°) on a slope of 10^{-4}. The canal is to be trapezoidal in shape having side slopes of 2 H: 1 V. The average temperature = 20°c for which $\nu = 10^{-6}$ m^2/s and $\rho_s = 2.65$. 12

8 a. What do you understand by control sections? What is the use of control section? 6

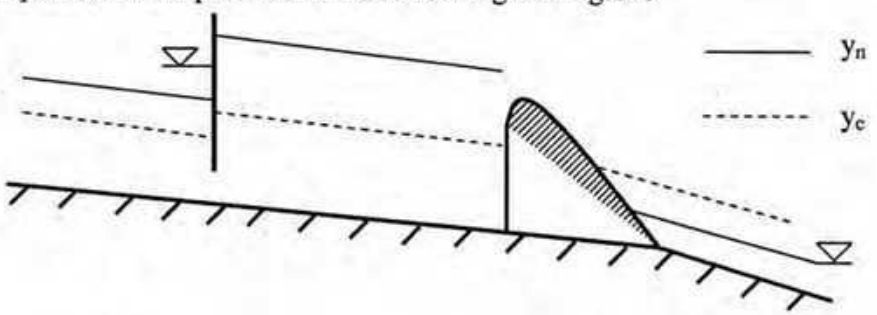
b. Sketch all the possible water surface profiles in the following cases, 9

(i) (ii) (iii)

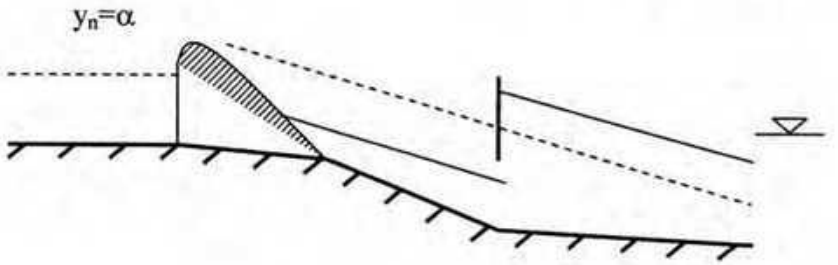


c. Sketch the possible flow profiles tor the following two figures 10

(i)



(ii)



FORMULAE

1. $\alpha = \dfrac{\int v^3 dA}{V^3 A}$ 2. $\beta = \dfrac{\sum v^2 \Delta A}{V^2 A}$ 3. $u = \dfrac{\int u.dy}{y}$ 4. $P = \gamma h$

5. , $h = h_s + c$ or, $h = h_s - c$ 6. $c = \dfrac{d}{g}\dfrac{v^2}{r}$ 7. $\left(\dfrac{P}{\gamma} + Z\right) = \int \dfrac{V^2}{gr} dr + cons\tan t$

8. $a_n = \dfrac{v^2}{r}$ 9. $\dfrac{y_2}{y_1} = \dfrac{1}{2}(\sqrt{1+8F_1^2} - 1)$ or, $\dfrac{y_1}{y_2} = \dfrac{1}{2}(\sqrt{1+8F_2^2} - 1)$

10. $\Delta E = E_1 - E_2$ 11. $\Delta E = \dfrac{(y_2 - y_1)^3}{4y_1 y_2}$ 12. $\dfrac{L_j}{y_1} = 9.75(F_1 - 1)^{1.01}$

13. $E_2 = E_1 - \Delta Z_1$ 14. $\dfrac{V_c^2}{2g} = \dfrac{y_c}{2}$, $E_c = \dfrac{3y_c}{2}$; $y_c = \left(\dfrac{q^2}{g}\right)^{\frac{1}{3}}$

15. $Q = \dfrac{2}{3} C_d \sqrt{2g} L H_1^{\frac{3}{2}}$ 16. $C_d = 0.611 + 0.08(H_1/P)$ which is valid for $H_1/P \leq 5.0$

17. For long weirs, $H_1/B_w \leq 0.1$, $C_d = 0.561(H_1/B_w)^{0.022}$

For broad crested weirs, $0.1 \leq H_1/B_w \leq 0.35$, $C_d = 0.028(H_1/B_w) + 0.521$

For narrow crested weirs, $0.45 \leq H_1/B_w \leq 1.5$, $C_d = 0.120(H_1/B_w) + 0.492$

18. $Q = C_d A\sqrt{2g\Delta H}$ 19. $V = \dfrac{1}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$ 20. $n = \dfrac{d_{50}^{\frac{1}{6}}}{21.1}$ 21. $n = \dfrac{d_{90}^{\frac{1}{6}}}{26}$

22. $n_{eq} = \dfrac{(\sum n_i^{\frac{3}{2}} P_i)^{\frac{2}{3}}}{P^{\frac{2}{3}}}$ 23. $\dfrac{\tau_s}{\tau_b} = K = \cos\theta\sqrt{1 - \dfrac{\tan^2\theta}{\tan^2\phi}}$ 24. $\tau_b = 0.90\tau_c$

25. $\tau_c^* = \dfrac{\tau_c}{g(\Delta\rho_s)d}$ Where, $\Delta\rho_s = \rho_s - \rho$ 26. $R_1^* = \left(\dfrac{\Delta\rho_s}{\rho}\right)^{\frac{1}{3}}\left(\dfrac{g^{\frac{1}{3}} d}{\nu^{\frac{2}{3}}}\right)$

27. $\tau_{bm} \leq \tau_b$, $\tau_{sm} \leq \tau_s$ 28. A =(b+zy)y and P= b + 2y$\sqrt{1+z^2}$ 29. $\dfrac{Q^2}{g} = \dfrac{(B+zy_c)^3 y_c^3}{B+2zy_c}$ 30. $B_c = 1.84\dfrac{Q}{\sqrt{g}E_1^{\frac{3}{2}}}$

31. $E_1^{'} = 1.5y_c = E_c$

32. $h = \left[\frac{1.818Q}{(p+0.5)m}\right]^{0.378}$

33. $P = 4.75\sqrt{Q}$

34. $R = 0.47\left(\frac{Q}{f_s}\right)^{\frac{1}{3}}$

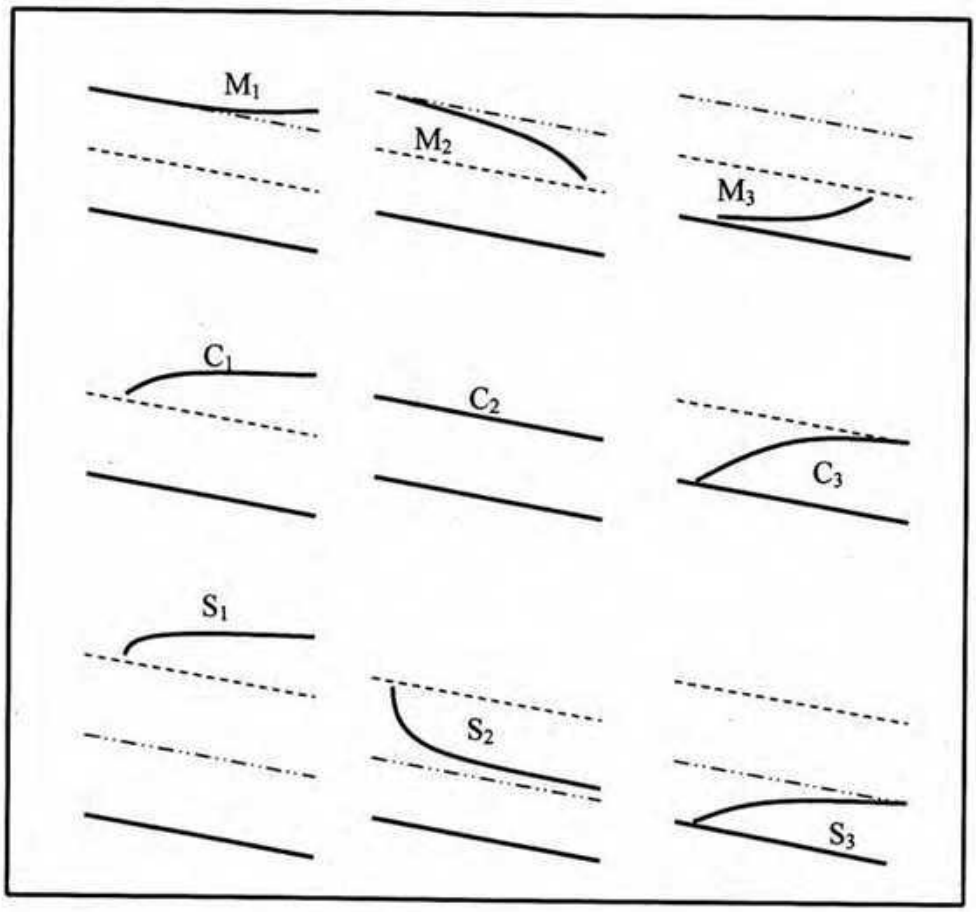
35. $S = 3\times10^{-4} f_s^{\frac{5}{3}} / Q^{\frac{1}{6}}$

36. $f_s = 1.76\sqrt{d}$

37. $Q = C_d A\sqrt{2g\Delta H}$

38. $y_2 = C_c a$

39. $C_d = \frac{C_c}{\sqrt{\left(1-(\frac{ac_c}{H_1}\right)^2}}$



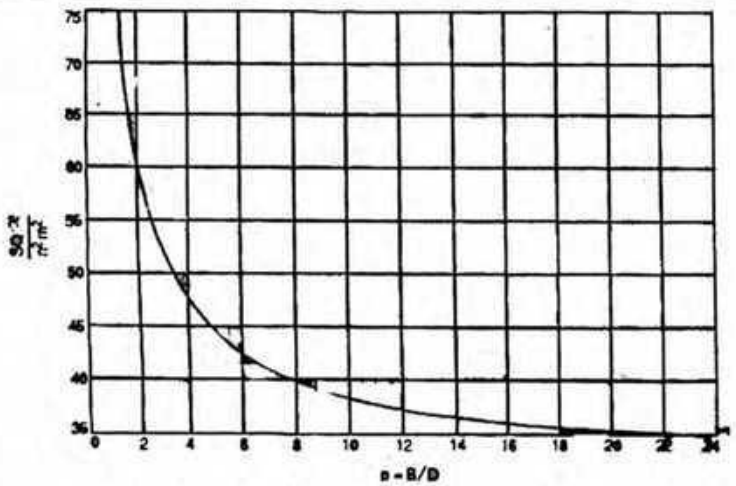


Figure: Diagram for design using Kennedy's equation

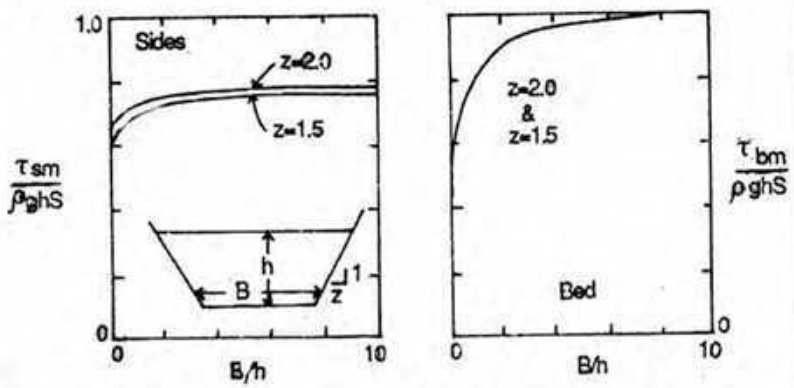


Figure: Maximum shear stresses on bed and sides of smooth trapezoidal channels

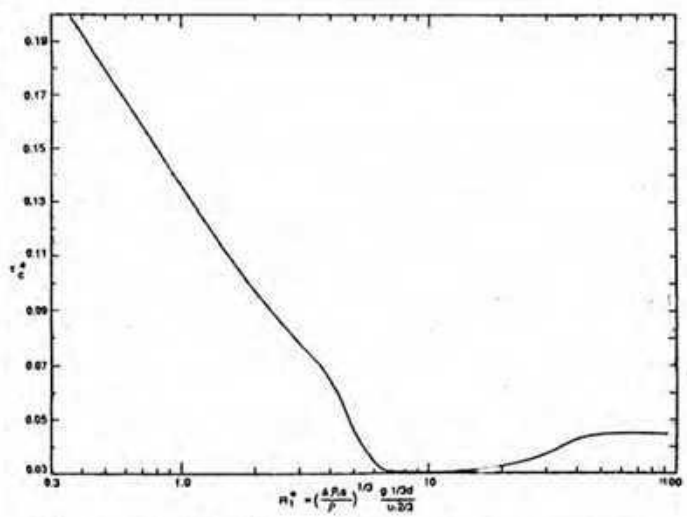


Figure: Modified form of Yalin-Karahan curve

The University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall 2010
Program: B.Sc Engineering (Civil)

Course Title: Engineering Hydrology Course Code.: CE 363 Credit hrs: 3
Time : 3 hours Full marks: 150

Section A
Answer any THREE
(Assume any reasonable data if not given)

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1. (a) Write short notes on (any Five) (15)
   i) Different storm systems
   ii) Climate of Bangladesh
   iii) WMO guideline for evaporation stations
   iv) Method of superposition
   v) Derivation of unit hydrograph
   vi) Weather cannot be forecasted accurately more than a few days ahead.
   vii) Assumptions of a unit hydrograph

   (b) Show with a neat diagram (any Two) (4)
   i) How water droplets in clouds form by nucleation
   ii) Life cycle of a frontal cyclone
   iii) Longitudinal cross section of the general atmospheric circulation

   (c) The average rainfall over a basin of area 50 ha during a storm was as follows: (6)

Time (h)	0	1	2	3	4	5	6	7
Rainfall (mm)	0.0	6.0	11.0	34.0	28.0	12.0	6.0	0.0

From this storm if the volume of runoff was measured as 25×10^3 m^3. Determine the Φ – index for the storm.

2. (a) Describe the different methods of base flow separation from a storm hydrograph. (5)

   (b) Write stepwise procedure to determine the average rainfall over a catchment using Isohyetal method. (5)

   (c) There are six raingauge stations in and around a catchment whose shape can be described by joining points through smooth curves of the following coordinates (distance in km): (4, 12), (5, 21), (8, 25), (14, 28), (18, 28), (20, 25), (22, 20), (25, 11), (22, 3) and (15, 4). Coordinates of the raingauge stations are: (4, 26), (14, 24), (8, 16), (22, 14), (12, 8) and (28, 6) and the annual rainfall recorded are: 85, 132, 120, 136, 125 and 93cm respectively. Find the mean precipitation for the given catchment by Thiessen polygon method. (15)

3. (a) Explain various commonly used methods of measurement of stage in a river. (7.5)

(b) With the help of typical hydrograph describe the salient features of (i) perennial (ii) intermittent (iii) ephemeral streams (7.5)

(c) The following are the data obtained in a stream-gauging operation. A current meter with a calibration equation V= (0.32 N+ 0.032) m/s, where N= revolutions per second was used to measure the velocity at 0.6 depth. Using the mid-section method, calculate the discharge in the stream. (10)

Distance from left bank	depth, d (m)	Current meter reading at 0.6d (m) below water surface	
		Rev.	Sec
0	0	0	0
2	0.50	80	180
4	1.10	83	120
6	1.95	131	120
9	2.25	139	120
12	1.85	121	120
15	1.75	114	120
18	1.65	109	120
20	1.50	92	120
22	1.25	85	120
23	0.75	70	150
24	0.00	0.00	0.00

4. (a) Discuss the factors that affect the process of evaporation. (10)

(b) Sketch a typical curve of infiltration and give its equation. (5)

(c) Estimate the daily potential evapotranspiration from the following data using Penman's formula:
(10)

i) Slope of the saturation vapour pressure vs. temperature at the mean air temperature = 1.40 mm/°C
ii) Mean temperature = 25°C
iii) Relative humidity = 85%
iv) Wind velocity at 4 m height = 90 km/day
v) Saturated vapour pressure e_w = 23.76 mm of Hg
vi) Net radiation = 7.573 mm of water per day
vii) Psychrometric constant = 0.49 mm of Hg/°C

Section B

Answer any THREE

(Assume any reasonable data if not given)

5. (a) Define synthetic unit hydrograph. Explain the procedure of deriving a synthetic unit hydrograph for a catchment by using Snyder's method. (13)

(b) Using the ordinates of a 12-h unit hydrograph given below, compute the ordinates of a 3-h unit hydrograph. (by S- curve method) (12)

Time (h)	Ordinates of 12-h Unit hydrograph (m^3/s)
0	0
6	10
12	37
18	76
24	111
30	136
36	150
42	153
48	146
54	130
60	114
66	70
72	30

6. (a) Describe the steps involved in Muskingum equation to determine the outflow discharge (5)

(b) The inflow and outflow hydrographs for a reach of a river are given below. Determine the best values of the Muskingum coefficients k and x for the reach. (20)

Time (h)	Inflow (cumec)	Outflow (cumec)
0	20	20
3	60	30
6	80	50
9	210	150
12	240	225
15	215	220
18	170	185
21	90	120
24	40	85
27	16	23

7. (a) Describe prism and wedge storage in a channel and also describe the role of 'x' in the Muskingum equation for channel routing. (10)

(b) The inflow hydrograph readings for a channel reach are given for which the Muskingum coefficients of k= 2.3 hr and x=0.15, and Δt = 1 hr. Route the flood through the reach and determine the attenuation and time lag of outflow. The initial outflow is 85 ft^3/s. (15)

Time (hr)	1	2	3	4	5	6	7	8	9
Inflow (cfs)	93	137	208	320	442	546	630	678	691
Time (hr)	10	11	12	13	14	15	16	17	18
Inflow (cfs)	675	634	571	477	390	329	247	184	134
Time (hr)	19	20							
Inflow (cfs)	108	90							

8. (a) Describe different methods to estimate the magnitude of a flood peak. (7)

(b) The following data give flood data statistics of two rivers surrounding Dhaka city: (18)

River	Length of records (years)	Mean annual flood (m^3/s)	σ_{n-1}
Buriganga	92	6437	2951
Balu	54	5627	3360

(i) Estimate the 100 and 1000 year floods for these two rivers by using Gumbel's method.

(ii) What are the 95% confidence intervals for the predicted values?

REDUCED MEAN $\bar{y}_n$ IN GUMBEL'S EXTREME VALUE DISTRIBUTION

N = sample size

N	0	1	2	3	4	5	6	7	8	9
10	0.4952	0.4996	0.5035	0.5070	0.5100	0.5128	0.5157	0.5181	0.5202	0.5220
20	0.5236	0.5252	0.5268	0.5283	0.5296	0.5309	0.5320	0.5332	0.5343	0.5353
30	0.5362	0.5371	0.5380	0.5388	0.5396	0.5402	0.5410	0.5418	0.5424	0.5430
40	0.5436	0.5442	0.5448	0.5453	0.5458	0.5463	0.5468	0.5473	0.5477	0.5481
50	0.5485	0.5489	0.5493	0.5497	0.5501	0.5504	0.5508	0.5511	0.5515	0.5518
60	0.5521	0.5524	0.5527	0.5530	0.5533	0.5535	0.5538	0.5540	0.5543	0.5545
70	0.5548	0.5550	0.5552	0.5555	0.5557	0.5559	0.5561	0.5563	0.5565	0.5567
80	0.5569	0.5570	0.5572	0.5574	0.5576	0.5578	0.5580	0.5581	0.5583	0.5585
90	0.5586	0.5587	0.5589	0.5591	0.5592	0.5593	0.5595	0.5596	0.5598	0.5599
100	0.5600									

REDUCED STANDARD DEVIATION S_n IN GUMBEL'S EXTREME VALUE DISTRIBUTION

N	0	1	2	3	4	5	6	7	8	9
10	0.9496	0.9676	0.9833	0.9971	1.0095	1.0206	1.0316	1.0411	1.0493	1.0565
20	1.0628	1.0696	1.0754	1.0811	1.0864	1.0915	1.0961	1.1004	1.1047	1.1086
30	1.1124	1.1159	1.1193	1.1226	1.1255	1.1285	1.1313	1.1339	1.1363	1.1388
40	1.1413	1.1436	1.1458	1.1480	1.1499	1.1519	1.1538	1.1557	1.1574	1.1590
50	1.1607	1.1623	1.1638	1.1658	1.1667	1.1681	1.1696	1.1708	1.1721	1.1734
60	1.1747	1.1759	1.1770	1.1782	1.1793	1.1803	1.1814	1.1824	1.1834	1.1844
70	1.1854	1.1863	1.1873	1.1881	1.1890	1.1898	1.1906	1.1915	1.1923	1.1930
80	1.1938	1.1945	1.1953	1.1959	1.1967	1.1973	1.1980	1.1987	1.1994	1.2001
90	1.2007	1.2013	1.2020	1.2026	1.2032	1.2038	1.2044	1.2049	1.2055	1.2060
100	1.2065									

c in per cent	50	68	80	90	95	99
$f(c)$	0.674	1.00	1.282	1.645	1.96	2.58

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B. Sc. Engineering (Civil)

Course Title: Project Planning and Management Credit Hours: 3.0 Course Code: CE 401
Time: 3 hours Full Marks: 100

Answer all 14 Questions [Note that Questions 11~14 have alternative (OR) questions]

(Graph sheet and MRP sheet should be supplied)

1. Define a Project. What are the stages of a project? Describe briefly the activities of each stage of a project. [6]

2. What are the differences between Pay Back Period and Discounted Pay Back Period? Discuss with appropriate example. [4]

3. Describe NPV and IRR with suitable example. Describe the consequences of NPV and IRR for the evaluation of a Project. [4]

4. Describe the Panel Consensus and Delphi Method for forecasting. Also describe their relative advantages. [4]

5. Describe the consequences where the value of α is close to 0 and close to 1 in exponential smoothing method. [4]

6. Calculate MAD and how many units should be produced in the month of May if the forecast for May is 500 for the following set of historical data [4]

Month	Demand	Forecast value
Feb	580	520
Mar	600	540
Apr	420	576.67

7. [4]

Quarter	Demand
1	650
2	678
3	720

Calculate the value forecast for quarter 4 using 3 quarter moving weighted average method (assign 2.5 times more weight for the most recent data compared to the oldest data and 1.5 times more weight for the second recent data compare to the oldest data).

8. Solve the following problem by the simplex method: [14]

Maximize $Z = 5x + 3y + 7z$

Subject to
$$x + y + 2z \leq 22$$
$$3x + 2y + z \leq 26$$
$$x + y + z \leq 18$$
$$x, y, z \geq 0$$

9. [10]

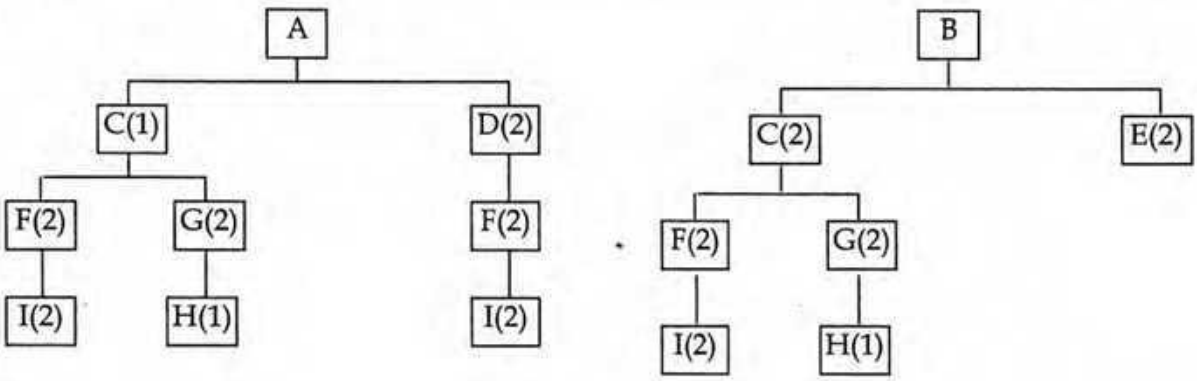
The R & D Department is planning to bid on a large project for the development of a new communication system for commercial planes. The accompanying table shows the activities, times and sequences required.

Activity	Immediate Predecessor	Time (weeks)
A	--	3
B	A	2
C	A	4
D	A	4
E	B	6
F	C, D	6
G	D, F	2
H	D	3
I	E, G, H	3

A. Draw the AON network diagram
B. Find the project completion time
C. Find the critical path
D. If you reduce the time required for activity D and E by 1 week each, find the project completion time and critical path as well.

10. [15]

Brown and Brown Electronics manufacture a line of digital audiotape (DAT) players. While there are differences among the various products, there are a number of common parts within each player. The bill of materials, showing the number of each item required, lead times and the current inventory on hand for the parts and components, are as follows:



Demand of products A, B and demand of spare components are shown below:

Item	Demand on 9th week	Demand on 7th week	On-Hand	Lead Time (Weeks)
A	700	-----	30	1
B	1200	-----	50	2
C	-----	270	75	1
D	320	----	80	2
E	-----	380	100	1
F	-----	100	150	1
G	-----	-----	40	1
H	-----	-----	200	1
I	-----	-----	300	1

Prepare a MRP schedule to satisfy demand (Use the supplied sheet)

11. [12]

Objective function:

Maximize $Z = 4x + 5y$

Constraints:

$$2x + y \leq 6$$
$$x + 2y \leq 5$$
$$x - 2y \leq 2$$
$$-x + y \leq 2$$
$$x + y \geq 1$$
$$x, y \geq 0$$

a. Find the feasible area by Graphical Method
b. Calculate the optimum value of x and y
c. Calculate the maximum profit
d. Find the range of optimality for x and y separately.

OR

Objective function:

Maximize $Z = 2x_1 + x_2$

Constraints:

$$x_1 + 2x_2 \leq 10$$
$$x_1 + x_2 \leq 6$$
$$x_1 - x_2 \leq 2$$
$$x_1 - 2x_2 \geq 1$$
$$x_1, x_2 \geq 0$$

a. Find the feasible area by Graphical Method
b. Find the optimum value of x_1 and x_2
c. Find maximum profit
d. Find the range of optimality for x_1 and x_2 separately.

12. [6]

A computer software firm has experienced the following demand for its "Personal Finance" software package.

Month 2007	Unit
January	56
February	61
March	55
April	70
May	66

Develop a regression analysis to forecast the demand and find the forecast for the month of January, 2008 (following year).

OR

Actual demand of a product of certain company has been given for four quarters and forecast has been estimated by 4 different methods (Method1, Method2, Method3, Method4). Using MAD, find the appropriate method of forecasting among the 4 methods.

Quarter	Demand	Method1	Method2	Method3	Method4
1	105	100	110	120	100
2	150	120	140	140	140
3	93	125	130	125	110
4	100	110	120	120	99

13. [6]

A dairy feed company may purchase and mix one or more of the three types of grains containing different amounts of nutritional elements. The data are given in the table below.

The production manager specifies that any feed mix for his livestock must meet at least minimal nutritional requirements and seeks the least costly among all such mixes. Formulate for linear programming model.

	Item	One unit weight of			Minimal Requirement
		Grain-1	Grain-2	Grain-3	
Nutritional ingredients	A	2	3	7	1250
	B	1	1	0	250
	C	5	3	0	900
	D	6	25	1	1232.5
Cost/unit weight (Tk)		41	35	96	

OR

A firm produces three products. These products are processed on three different machines. The time required to manufacture one unit of each of the three products and the daily capacities of the three machines are given in the table below.

It is required to determine the daily number of units to be manufactured for each product. The profit per unit of product 1, 2 and 3 is Tk. 4, Tk. 3 and Tk. 6 respectively. It is assumed that all amount produced are consumed in the market.

Formulate mathematical model for the problem.

Machine	Time per unit (minutes)			Machine capacity (minutes/day)
	Product-1	Product-2	Product-3	
M1	2	3	2	440
M2	4	-	3	470
M3	2	5	-	430

14. [7]

Assign the tasks to the employees such that each employee will be assigned by only one job to maximize the total effectiveness.

Find at least two multiple solutions if there is any.

Employees \ Tasks	1	2	3	4	5
A	25	55	60	45	30
B	45	65	55	35	40
C	10	35	45	55	65
D	40	30	70	40	60
E	55	45	40	55	10

OR

Assign the tasks to the employees such that each employee will be assigned by only one job to minimize the total cost.

Find at least two multiple solutions if there is any.

Employees \ Tasks	1	2	3	4
A	5	7	11	6
B	8	5	9	6
C	4	7	10	7
D	10	4	8	3

MRP Sheet

		1	2	3	4	5	6	7	8	9
	Gross requirements On-hand Net requirements Planned-order receipt Planned-order release									
	Gross requirements On-hand Net requirements Planned-order receipt Planned-order release									
	Gross requirements On-hand Net requirements Planned-order receipt Planned-order release									
	Gross requirements On-hand Net requirements Planned-order receipt Planned-order release									
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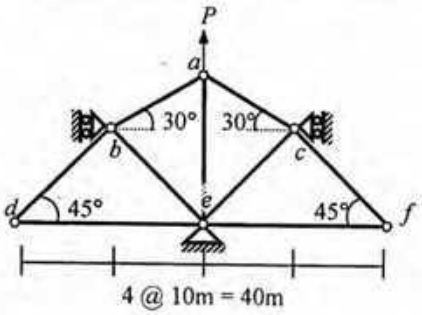
	Gross requirements On-hand Net requirements Planned-order receipt Planned-order release									

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010 (Set B)
Program: B. Sc. Engineering (Civil)

Course Title: Structural Engineering III | Credit Hours: 3.0 | Course Code: CE 411
Time: 3 hours | Full Marks: 100 (= 10 × 10)

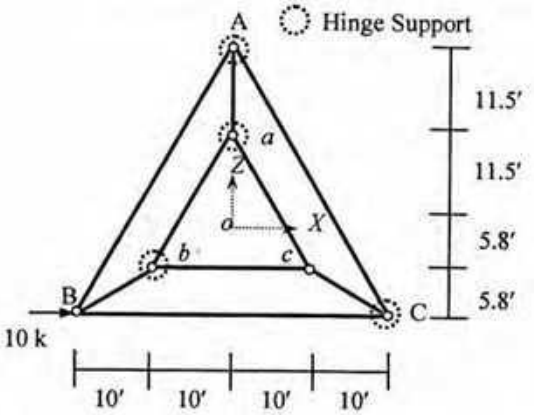
[Answer **any 10 (ten)** of the following 14 questions]

1. Ignoring zero-force members, formulate the stiffness matrix, load vector and write down the boundary conditions of the plane truss loaded as shown below [Given: S_x = constant = 10 kN/mm].

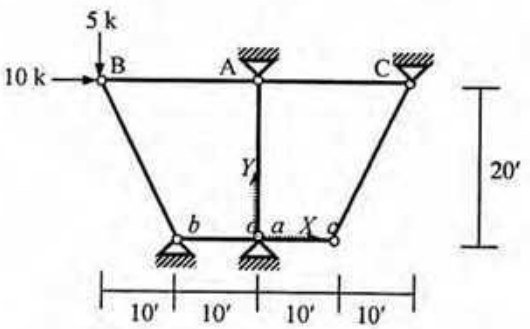


2. In the plane truss described in Question 1, joints b and c both deflect 10-mm upward. Without formulating the stiffness matrix, calculate the (i) axial force in all members, (ii) applied force P [Given: S_x = constant = 10 kN/mm].

3. Ignoring zero-force members, formulate the stiffness matrix, load vector and calculate the deflections (in X-, Y- and Z-directions) at joint B of the space truss OabcABC loaded as shown below (with nodal coordinates) [Given: S_x = constant = 500 k/ft].



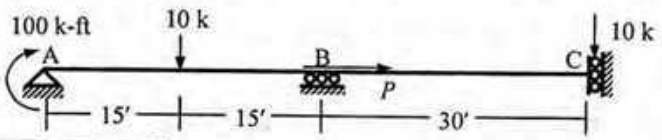
Top View



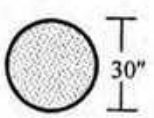
Front View

Nodal Coordinates (in ft)
o (0, 0, 0), a (0, 0, 11.5), b (−10, 0, −5.8), c (10, 0, −5.8), A (0, 20, 23), B (−20, 20, −11.6), C (20, 20, −11.6)

4. Assemble the stiffness matrix, load vector and calculate the unknown joint deflections and rotations of the beam ABC loaded as shown below, considering axial and flexural deformations as well as boundary conditions [Given: P = 500 k, F = 10 k, $E = 400 \times 10^3$ k/ft^2].

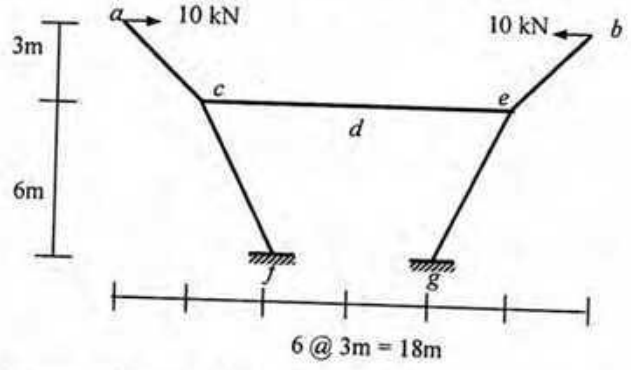


B and C are Guided Rollers

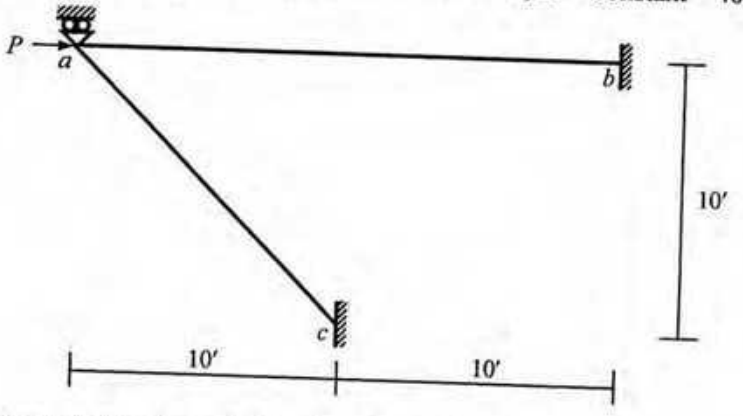


Beam Section

5. Use the Stiffness Method to calculate the rotation at joint c and deflection at d of the frame *abcdefg* loaded as shown below, considering flexural deformations only and symmetry of the structure [Given: EI = constant = 10×10^3 kN-m^2].

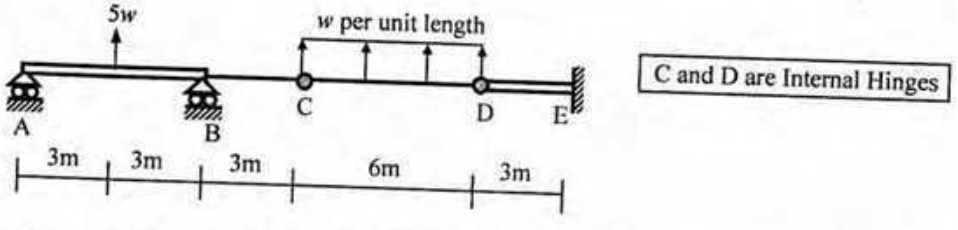


6. For the frame *abc* shown below, consider
   (i) axial deformations only to calculate the axial forces (in terms of P) in members *ab* and *ac*,
   (ii) flexural deformations only with geometric nonlinearity to calculate the force P needed to cause buckling of the frame [Given: EA = constant = 400×10^3 k, EI = constant = 40×10^3 k-ft^2].



7. For the beam ABC loaded as shown in Question 4, consider
   (i) axial deformations only to draw the axial force diagram,
   (ii) flexural deformations only with geometric nonlinearity to calculate the unknown joint deflections and rotations.

8. Use the bending moment diagram to calculate the value of M_p needed to prevent plastic hinge mechanism from developing in the beam ABCDE loaded as shown below, if w = 10 kN/m [Given: $M_{p(BCD)} = M_p$, $M_{p(AB)} = M_{p(DE)} = 2M_p$].

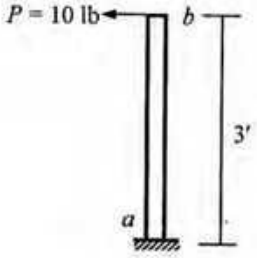


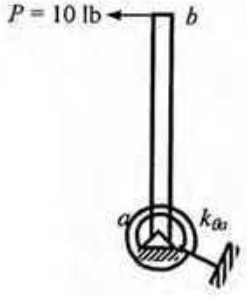
9. Use the Energy Method to calculate the distributed load w (kN/m) necessary to develop plastic hinge mechanism in the beam ABCDE described in Question 8 [Given: $M_{p(BCD)}$ = 100 kN-m, $M_{p(AB)} = M_{p(DE)}$ = 200 kN-m].

10. Use the Constant Average Acceleration (CAA) Method to calculate the horizontal deflection at joint B of the beam ABC (with lumped mass) loaded as shown in Question 4, at time t = 0.10 sec after starting from rest (i.e., with no initial displacement and velocity), if its damping ratio is (i) zero, (ii) 5 % [the beam weighs 0.30 k/ft].

11. Use the consistent-mass matrix (considering flexural deformations only) to calculate the natural frequencies of the beam ABC described in Question 4, if it weighs 0.30 k/ft.

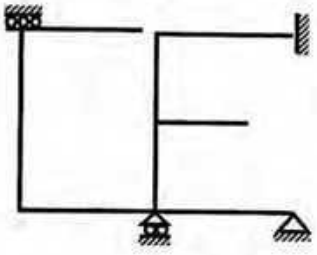
12. The figure below represents a cricket stump *ab* that has been hit by a horizontal force $P = 10$ lb at *b*. Calculate the horizontal deflection and rotation at point *b* of the stump, considering the joint *a* to be
    (i) fixed (i.e., no deflection and rotation at *a*) [Hint: May use $\delta = PL^3/3EI$, $\theta = PL^2/2EI$],
    (ii) hinged (i.e., no deflection at *a*) and additionally supported by a circular foundation of 0.5-ft radius on sub-soil (half-space) with shear-wave velocity (v_s) equal to 1000 ft/sec
    [Given: Unit weight of soil = 120 lb/ft^3, Poisson's ratio = 0.25, *EI* of the stump = 500 lb-ft^2].



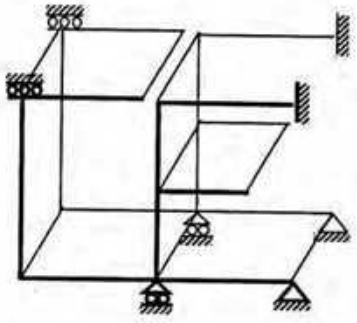


13. Briefly explain
    (i) the effect of foundation flexibility on the structural response to wind load and seismic vibration
    (ii) the difference between lumped-mass and consistent-mass systems
    (iii) the possible causes of nonlinearity in structural analysis
    (iv) 'structural instability' in terms of structural deflection and determinant of stiffness matrix
    (v) how the matrix $\mathbf{K}^G$ of a 2D truss member can be derived from matrix $\mathbf{K}^G$ of a 3D truss member.

14. Determine the size of the stiffness matrices of the 2D frame and 3D frame shown below
    (i) with and without considering the boundary conditions,
    (ii) if axial deformations are neglected.



2D Frame



3D Frame

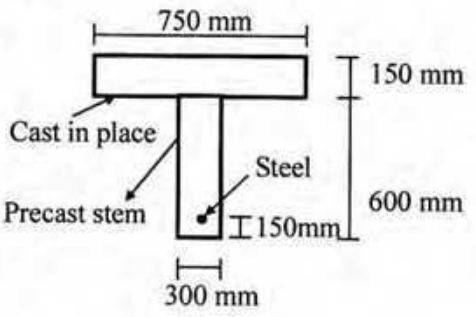
The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B. Sc. Engineering (Civil)

Course Title: Structural Engineering V (Prestressed Concrete) Course Code: CE 415
Time: 2 Hours Full Marks: 100

[Answer any 5 (five) of the following 7 (seven) questions]
[Symbols carry their conventional meanings]

1) (a) The mid-span section of a composite beam is shown in the following Figure. The effective prestress is 1750 kN assuming the total loss as 15%. Compute the stresses in the section at various stages if the bending moment at the section is as follows: 15

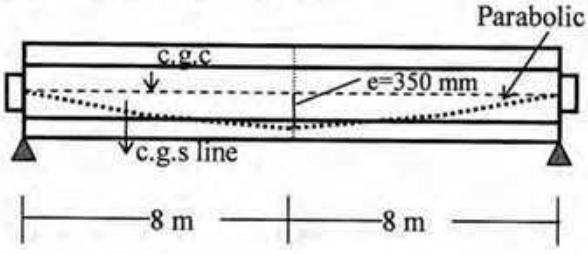
- due to weight of precast stem= 350 kN-m
- due to top slab= 110 kN-m
- due to live load= 550 kN-m

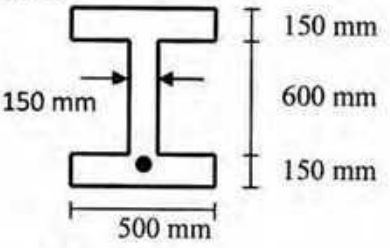


b) Explain stress distribution in concrete according to elastic theory 05

2) a) The beam shown in the following figure carries a superimposed dead load of 6 kN/m and service live load of 1 kN/m in addition to its self weight. It has to carry a concentrated live load of 50 kN at mid-span.Assume that superimposed dead load are applied soon after prestress transfer.
Given: A_{ps}=1730 mm^2 , A_c=240×10^3 mm^2, I=2.408×10^{10} mm^4

f_{pi}=1300 MPa, f_{pe} =1120 MPa (after 15 years)
C_u=2.30, γ_{con}=24 kN/m^3
E_{ci}=25100 MPa, E_c=27400 MPa





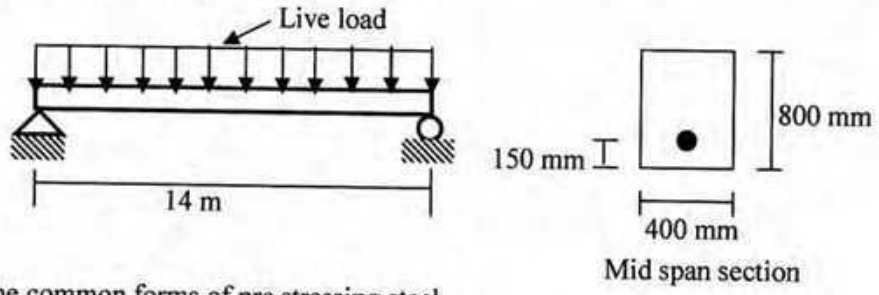
Calculate the mid-span deflection

Mid span section

I. Immediately at transfer of prestress and II. after 15 years. 16

b) Show the desirable layouts for two simple pretensioned and two simple post tensioned beams. 04

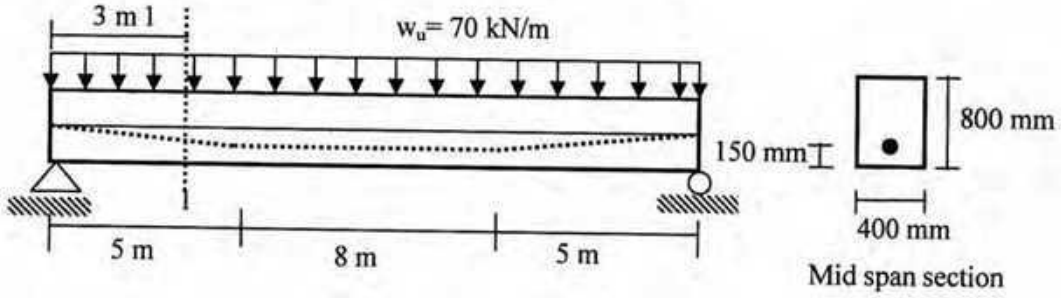
3. a) Compute the value of live load that the following beam can carry to produce 1.75 MPa tensile stress (flexural) at midspan section. Use the principle of internal resisting couple (second concept) for the analysis. Given: n=7, Effective prestress=1400 kN 16



b) Describe the common forms of pre stressing steel. 04

4. a) Check shear strength at section 1-1 for the following beam. Given that this section is adequate for w_u= 70 kN/m on the basis of its flexural strength.

Given: f_c'= 40 MPa, f_{so}=1200 MPa, f_{se}= 1000 MPa, A_{ps}=1760 mm^2 16



b) Write a short note on flexural bond strength. 04

5. a) Categories different types of cracks for a simply supported beam and comment on the cracks with respect to the shear –moment ratio. 05
b) Draw the cable layout for cantilever beams 05
c) Show with the sketches the uses of non-prestressed reinforcement at the following stages: 05

- Just after transfer of prestress
- At working and ultimate loads

d) Define "transfer length" in pretensioned concrete member. Write down the parameters which affect the transfer length for prestressing steel of pretensioned member. 05

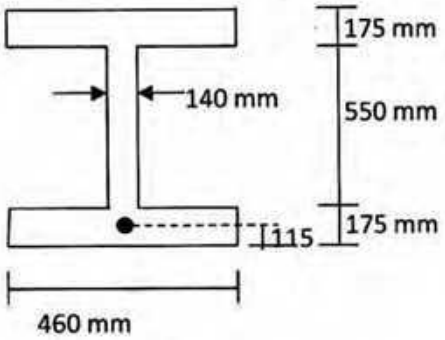
6. Design a simply supported Prestressed concrete beam of span 30m having an overall depth of 1.8 m. The beam is to support a total load of 15 kN/m including self weight. Given: f_c'= 30 MPa, f_{pu}= 1600 MPa ,f_{so} =0.7 f_{pu}

f_t=-13.5 Mpa , f_b=-19.5 MPa

Design as T beam and assume total loss=20% 20

7. a) Write down the steps in a pre tensioning process. 04

b) Calculate the ultimate moment capacity of the PC beam shown in the following figure. The beam is prestressed with A_{ps}=2350 mm^2 with an effective prestress, f_{se}=1100 MPa. Given: f_{pu}=1860 MPa, f_c'=48 MPa 16



Annexure-1

Formulas

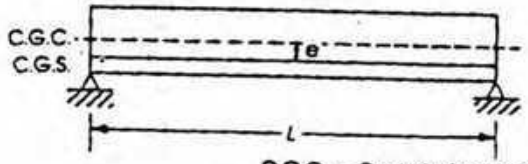
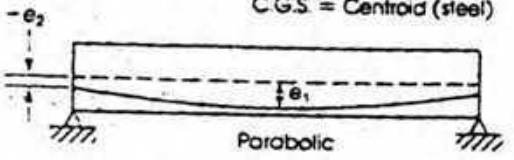
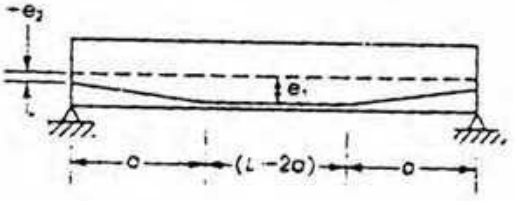
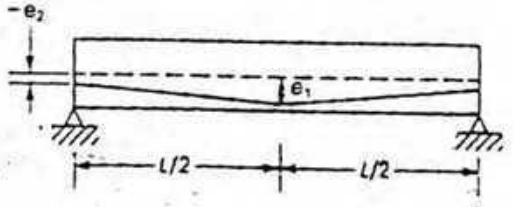
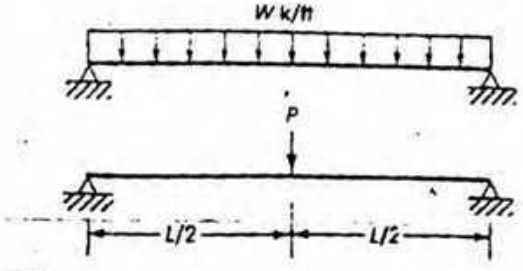
- $ES=(E_s/E_{ci})\times f_{cir}= n\times(F_o/ A + F_o e^2/I - M_g e/I)$

[F_o= 0.9F_i (pretensioned member)]

- $e= M_G/F_o + k_b$
- $e= (M_G+f_t' A k_b)/F_o + k_b$
- $F=M_T/(e+k_t)$
- $F=(M_T-f_b' A k_t)/(e+k_t)$
- $A_c = \dfrac{F_o h}{f_b c_t - f_t' c_b}$
- $A_c = \dfrac{Fh}{f_t c_b - f_b' c_t}$
- $A_c = \dfrac{Fh}{f_t c_b}$
- $A_c = \dfrac{F_o h}{f_b c_t}$
- $A_c = \dfrac{F_0}{f_b}(1 + \dfrac{e - (\frac{M_G}{F_0})}{k_t})$
- $V_{ci}=0.05\sqrt{f_c'} b_w d + V_d + V_i M_{cr}/M_{max} \geq 0.14\sqrt{f_c'} b_w d$
- $M_{cr}=[I/y_t]\times(0.5\sqrt{f_c'}+f_{pe}-f_d)$
- $V_{cw}= 0.29\sqrt{f_c'} b_w d + 0.3 f_{pc} b_w d + V_p$
- $\Delta = -\Delta_{pi} + \Delta_0$
- $\Delta = -\Delta_{pi} - \dfrac{\Delta_{pi} + \Delta_{pe}}{2} C_t + (\Delta_0 + \Delta_d)(1 + C_t) + \Delta_l$
- $C_t = \dfrac{t^{0.60}}{10 + t^{0.60}} C_u$

Annexure-2

MIDSPAN DEFLECTIONS OF SIMPLY SUPPORTED BEAMS

Schematic	*Deflection equations*
Camber due to prestressing force	
 C.G.C. = Centroid (concrete) C.G.S. = Centroid (steel)	$\Delta = \frac{(Fe)L^2}{8EI}$ (1) (Horizontal tendons)
	$\Delta = \frac{FL^2}{8EI}\left[\frac{5}{6}e_1 + \frac{1}{6}e_2\right]$ (2) When $e_2 = 0$: $\Delta = \frac{5(Fe_1)L^2}{48EI}$ (3)
	$\Delta = \frac{FL^2}{8EI}\left[e_1 + \frac{4}{3}\left(\frac{a}{L}\right)^2 (e_2 - e_1)\right]$ (4) When $a = \frac{L}{3}$: $\Delta = \frac{FL^2}{8EI}\left[e_1 - \frac{4}{27}(e_2 - e_1)\right]$ (5) When $a = \frac{L}{3}$ and $e_2 = 0$: $\Delta = \frac{23(Fe_1)L^2}{216EI}$ (6)
	$\Delta = \frac{FL^2}{24EI}[2e_1 + e_2]$ (7) When $e_2 = 0$: $\Delta = \frac{(Fe_1)L^2}{12EI}$ (8)
Deflection due to gravity loads	
	$\Delta = \frac{5wL^4}{384EI}$ (9) $\Delta = \frac{PL^3}{48EI}$ (10)

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B.Sc. Engineering (Civil)

Course Title: Environmental Engineering III — Course Code: CE 431
Time: 2 hour — Full marks: 100

There are **FIVE** questions. Answer any **FOUR**.
(Note: Assume any missing data)

1. (a) Discuss the effects of solid waste mismanagement. (7)

   (b) What is on-site processing, describe its importance. Discuss main objectives of solid waste management. (3+5)

   (c) Composition of solid wastes in a landfill site (containing only organic matter) is given in the following table along with a typical data on ultimate analysis of the combustible portion in the municipal solid wastes. (10)

Component	Wet mass (Kg)	Component					
		C	H		N	S	Ash
Food waste	45	13	0.5	2.5	0.5	0.03	1.47
paper	22	5.5	1.3	6.4	0.71	0.09	1.0
cardboard	8	3.1	0.31	3.2	0.06	0.03	0.8
plastics	5	3.3	0.35	1.1	---	----	0.15
Garden trimming	15	1.7	0.65	1.85	0.25	0.01	0.54
Wood	5	2.1	0.21	1.35	0.2	----	0.14

   Determine the energy content of 100 kg of typical MSW.

2. (a) Discuss two collection systems of solid wastes based on availability of services. (6)

   (b) Write down the environmental justification of recycling and reuse. (5)

   (c) Describe about the present practices of recycling processes in Bangladesh. (6)

   (d) Based on traffic studies of an industrial park, where a hauled-container solid wastes collection system is practiced, it is found that average time to drive from garage to the first container and last container to the garage each day is 20 and 25 min respectively. If the average time required to drive between containers is 10 minutes and the one-way distance to the disposal site is 25 Km (speed limit: 88 km/h), determine the actual length, based on an 8-hour working day. (8)

3. (a) What are the basic differences between biogas and composting method? (3)

   (b) Name four treatment processes of leachate. What strategy should be followed to minimize the amount of leachate in landfill? (2+5)

   (c) What are the factors that must be considered in evaluating the potential site for (7)

the long-term disposal of solid wastes?

(d) Municipal solid waste from packer trucks is placed and well-compacted in a sanitary landfill site in three lifts, each lift is 2m(6.5ft) deep, separated by a 250mm (10in) clay layer and topped with a 1m (40in) thick clay cap, having a 4% slope. If annual precipitation in the area is 900mm (36in), of which 67% is lost through evapotranspiration, estimate (8)
(a) the quantity of leachate that will be generated and
(b) the time until the refuse (garbage) is saturated and the leachate flows from the landfill.
Assume that the separating clay layers are saturated when placed and do not affect the leachate percolation rate through the refuse.

4. (a) Why landfill regulations are necessary? (3)

(b) Discuss the different generation phases of landfill gases with necessary figures. (6)

(c) What type of landfill system is adopted in Matuail at Dhaka? Discuss the method of gas migration control with sketch. (8)

(d) Estimation of the amount of gas produced from the organic fraction of MSW under anaerobic conditions. Estimate the total theoretical amount of gas that could be produced under anaerobic conditions in a sanitary landfill per unit weight of solid wastes given that the chemical formulas of the typical waste are as follows: (8)

Without water: $C_{60}H_{94.3}O_{37.8}N$
With water : $C_{60}H_{56.3}O_{69.1}N$

Given that the total weight of organic material in 100 lb of solid waste is equal to 80.0 lb including moisture.

5. (a) Discuss about the hazardous waste management (HWM) with hierarchy of HWM. (5)

(b) Name the land disposal techniques of hazardous waste. Describe any two of them. (2+5)

(c) Name the categories of health care wastes. Mention the attributes of oceans for which hazardous industrial wastes are dumped safely to oceans. (2+5)

(d) An industrial area in the province of Ontario with 4 million residents is planning to build a facility to treat its hazardous wastes. As a preliminary basis of sizing this project and excluding wastes (rinse water and other dilute wastes) that can be treated by the industries in on-site lagoons, estimate the annual amounts of: (6)
(A) industrial waste (hazardous waste) generated by industry
(B) hazardous wastes reaching the off-site disposal
(C) off-site wastes that could be incinerated

Department of Civil & Environmental Engineering
University of Asia Pacific

CE 485

Term Final Examination

Marks: 100 Time: 2 hrs.

There are 8 (EIGHT) questions, Answer any 5 (FIVE).

1. Values of "Environmental Qualities (EQ)" of a proposed International Airport at Ariyal Kha beel are given below. Determine Environmental Importance (W) for "human health". 20

Parameters	Values of EQ		W
	With project	Without project	
Land value	5	1	100
Agriculture	3	6	200
Human health	3	6	?
Socio-economic condition	10	2	250
Fisheries	1	6	200
Noise	4	8	100

Also determine whether the project is environmentally sustainable or not.

2. RAJUK is going to develop a model town at Purbachal. Discuss briefly the environmental issues for that urban growth centre. 20

3. Define sustainable development. Discuss briefly the conceptual model of sustainable development. 20

4. Define – (i) EIA, (ii) Population carrying capacity, (iii) Basic demand, secondary demand and luxury demand for human consumption, (iv) poverty level & prosperity level of living. 3+7+6+4

5. Discuss the guiding strategy to achieve the goal of sustainable development. 20

6. Discuss briefly the different classification of standards. 20

7. Discuss briefly the air pollution standards in Bangladesh. 20

8. (a) State the drinking water quality standard of Bangladesh for the following parameters. 10

   (i) arsenic, (ii) chloride, (iii) iron, (iv) hardness and (v) total dissolved solids.

   (b) Mention the standard values of the parameters of BOD and COD of the industrial effluent for (i) discharge into inland water, (ii) in sewer for secondary treatment and (iii) discharge on land for irrigation. 10

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program : B.Sc Engineering (Civil)

Course Title: Transportation Engineering II | Course Code: CE 451
Time:3hrs | Full Marks: 150

There are **SEVEN** questions. Answer any **FIVE.**

1. (a) Why is it necessary to provide the followings in transportation facilities? (09)
(i) Geo-textile (ii) Point and crossing (iii) Coning of wheel
(b) Find out the length of the transition curve for a M.G curve of three degrees, having a cant of 10 cm. The maximum permissible speed on the curve is 80 kmph. (06)
(c) List out common gauges with their dimensions? Why is it desirable to use uniform gauges in a country? (3+7)
(d) Establish a relationship between Degree of Curvature and Versine of Curve. (05)

2. (a) Briefly lists the important requirements of ideal (i)Rail, (ii)Elastic Fastening, (iii)Ballast. (12)
(b) What is ballast cushion? (05)
(c) Write a short note on Semaphore signal. (06)
(d) Write down the classification of yards. (07)

3. (a) What is roaring of rails? What are the causes and effect of roaring? How can you minimize this effect? (2+4+3)
(b) Compute the steepest gradient that a train of 20 wagons with a locomotive can travel with the following data: (12)

Weight of each wagon	=	22 tones
Weight of locomotive	=	150 tones
Tractive effort of locomotive	=	15 tones
Rolling resistance of locomotive	=	3 kg/tone
Rolling resistance of wagon	=	2.5 kg/tone
Speed of the train	=	70 kmph

(c) What is interlocking? (03)
(d) Why generally the followings are favored? (06)
(i) Flat footed rail (ii) Concrete sleeper

4. (a) Write down the functions and desirable characteristics of pavement. (2+4)
(b) Show different components of flexible and rigid pavement and write down the comparison of rigid and flexible pavement. (4+8)
(c) What are the functions of surface, base and sub-base courses? (06)
(d) Write down the desirable properties of sub-grade soil and factors affecting sub-grade strength. (06)

5. (a) What is soil stabilization? Write down the purposes of soil stabilization. (06)

(b) Describe the desirable characteristics of bituminous mixes and design procedure of bituminous mixes. (4+6)

(c) What are the common tests carried out on aggregates for road construction? What do you mean by 'flaky and elongated aggregate' and angularity number? (6+4)

(d) Write down the limitations of CBR tests. (04)

6. (a) Briefly describe the methods of soil stabilization. (12)

(b) Describe the Marshall Method of mix design showing typical test property curves and their trends. (12)

(c) Write down the assumptions and criticism of Boussinesq's Theory of Flexible Pavement Design. (06)

7. (a) Describe different types of pavement distresses, their causes and repair Techniques. (15)

(b) The expected average daily traffic of a two-lane two way highway comprises of the following vehicles in the base year: (10)

Single axle load,kips	Repetition per day
5	100
8	200
10	150
13	940
16	1260
18	373
20	216
22	58
25	55
27	23

The vehicle damage factor has been found to be 3. The annual growth rate of traffic is 10% and period of construction is two years. The pavement is to be designed for 15 yrs after completion. Calculate the cumulative standard axles to be used in design.

(c) Describe the favorable properties of aggregates. (05)

The University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall 2010
Program: B. Sc. Engineering (Civil)

Course Title: Irrigation and Flood Control — Course #: CE 461

Time: 3 hours — Full Marks: 150

SECTION A

Answer question No. 1 and any THREE from the rest

(Assume any reasonable data if not given)

1. (a) Distinguish between the following (any four) (16)
   (i) Surface and sub-surface irrigation
   (ii) Concrete weir and rock-fill weir
   (iii) Aqueduct and siphon aqueduct
   (iv) Ogee and drop spillways
   (v) Centrifugal pump and rotary pump
   (vi) Contour canal and watershed canal

   (b) Using Khosla's curves, determine the following for the apron shown below: (18)
   [Assume: floor thickness = 1 m]

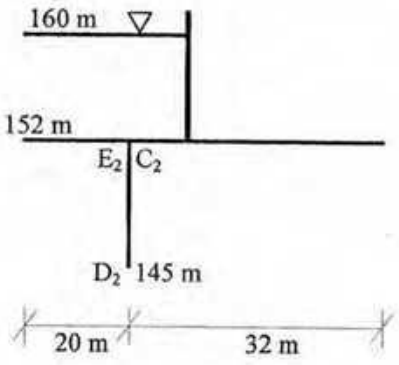


Fig. (i)

(i) Find pressure at critical points with thickness correction

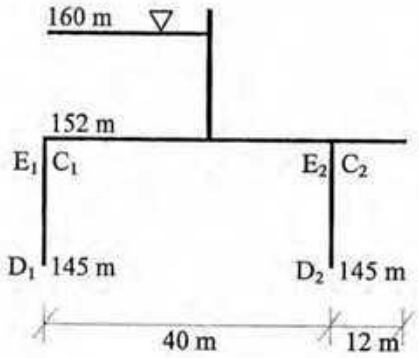


Fig. (ii)

(ii) Find pressure at C_1 and E_2 with interference correction

Correction factor for slope, 3:1 = 4.5

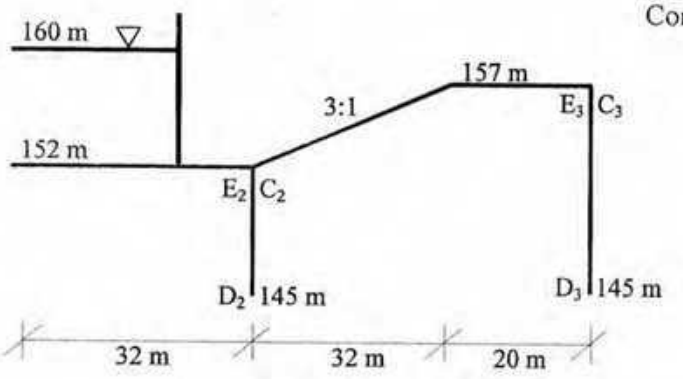


Fig. (iii)

(iii) Find pressure at point C_2 with slope correction

2. (a) Explain quality of irrigation water. Describe sprinkler irrigation method along with its advantages and disadvantages. (10)

(b) Find the relationship between discharge through an irrigation system, the average depth of water, the rate of infiltration, the area of the land irrigated and the approximate time required to cover the given area with irrigation. Also find the maximum area that can be irrigated with the supply. (6)

(c) An area of 300 hectares is to be irrigated from a minor channel with one outlet; C.C.A is 80% of total area. The intensity of irrigation is 50% for Rabi and 30% for Kharif crop. Taking loss in conveyance system as 5% of outlet discharge, determine the design discharge of the channel. Take outlet discharge factor for Rabi season as 1500 ha/m^3/sec and for Kharif season 1000 ha/m^3/sec. (6)

3. (a) What is cross-drainage works? Explain its necessity. (2+4)

(b) Explain canal head regulator along with its functions. (5)

(c) What is 'borrow pits'? Explain its importance to make an economical irrigation canal (4)

(d) A clayey soil has field capacity of 22 % and wilting coefficient of 10 %. The dry unit weight of soil is 1.3 gm/cc. If the root zone depth is 70 cm, determine the storage capacity of the soil. Irrigation water is applied when moisture content falls to 14 %. If the water application efficiency is 75 %, determine the water depth required to be applied in the field. (7)

4. (a) What are the main advantages of lined canal? How will you justify economically the necessity of lining an existing canal? (10)

(b) What are the important aspects need to be included in an irrigation project report? Why failure due to subsurface flow is critical for designing barrage or weir? (6)

(c) A crop having 4 months crop period is to be grown in a place. Average monthly temperature is 18^0C, effective rainfall is 5 cm and average monthly percent of annual day light that occur during the period is 7.5. Determine consumptive irrigation requirement of that crop in cm using Blaney-Criddle equation and a crop factor equal to 0.7. (6)

5. (a) Distinguish between Glacis fall and Vertical drop fall with sketch. (5)

(b) Describe a reciprocating pump with sketch along with its advantages and disadvantages. (5)

(c) What types of place is suitable for selecting diversion head works? (4)

(d) Determine the possible delivery head for a residential building if you purchase a centrifugal pump from the market with the following specifications: (8)

Brake Horse Power	= 35
Suction Head	= 5 m
Coefficient of friction	= 0.01
Pump efficiency	= 80 %
Pipe diameter	= 15 cm
Required delivery flow rate	= 150 l/s

Section B

Answer Question no. 6 and any THREE from the rest

6. What are the types of measures of flood management? Distinguish between them. Write down the methods of Flood management under each type. (2+3+9)

7. Explain the following (any three) (12)
   (i) Flood forecasting
   (ii) Causes of flood
   (iii) Water logging
   (iv) Integrated Flood management

8. (a) Write down the names of the major studies and plans that shaped the water resources development of Bangladesh. (6)
   (b) Write down the major directives of the National Water Policy. (6)

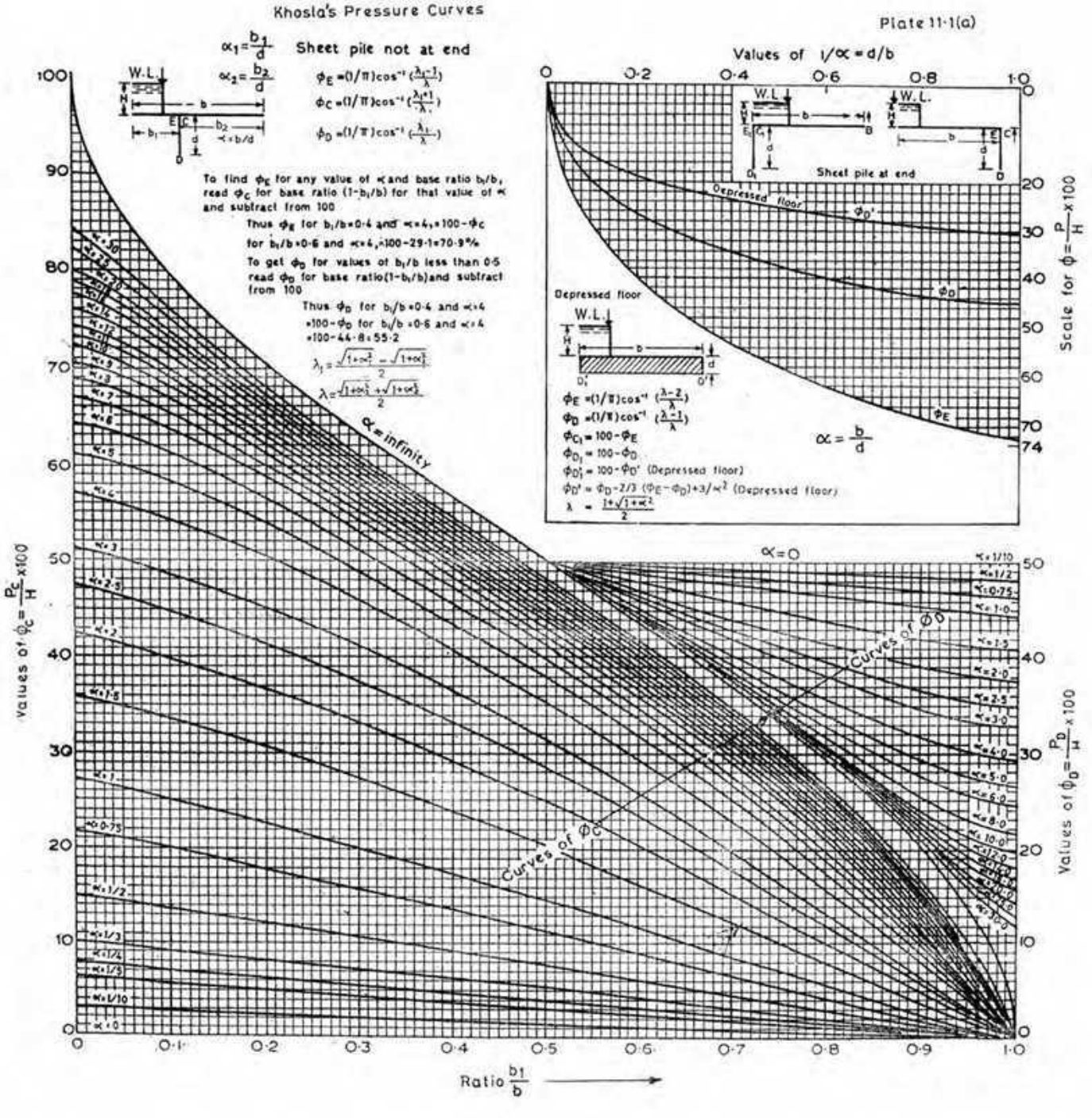
9. (a) Explain impacts of flood. (7)
   (b) What are the objectives of flood management? (5)

10. (a) What is Leaching Requirement? (5)
    (b) Estimate the Leaching Requirement when EC value of saturated soil extract of soil is 10 milli mho/cm at 25°C. The EC value of irrigation water is 1.0 milli mho/cm. What will be the required depth of water to be applied to the field if the consumptive use requirement of the crop is 80 mm? EC value of leaching water may be suitably assumed. (7)

11. (a) What are the types of lift irrigation? Give examples. (3+3)
    (b) What are the advantages and disadvantages of flood control projects? (6)

Khosla's Pressure Curves

Plate 11·1(a)



The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B.Sc. Engineering (Civil)

Course Title: Environmental Engineering VIII (GIS and Remote Sensing) Course Code: CE 531 Credit: 2.00

Time: 2 hours Full Marks: 50

Answer all questions. Use ArcView software to solve these problems. Use "Fall_10" data folder.

12+4+2+2=20

1. Bangladesh upazilla map is given in "upazilla.shp". Annual average rainfall (in mm) is given in 'rainfalll.xls' file.
   (a) Create a map based on rainfall amount.
   (b) Find out how many upazilla have rainfall amount greater than 1500 mm but less than 2500 mm. What is the average rainfall of these upazilla?
   (c) For jute cultivation minimum annual rainfall requirement is 2500 mm. Calculate the total area in sqkm suitable for jute cultivation.
   (d) Prepare a layout showing upazilla wise rainfall amount.

6+3+3+3=15

2. a. Bangladesh upazilla map is given in "upazilla.shp". Soil type is given in 'soil.xls' file. Aggregate these upazilla based on same soil type, create a map and present it on a layout map.

   b. Add **districts.shp** in your view. There are four airports in Bangladesh. They are situated in Dhaka, Chittagang, Sylhet and Jessore District. Create a point theme map showing the four airports and add attributes as follows:

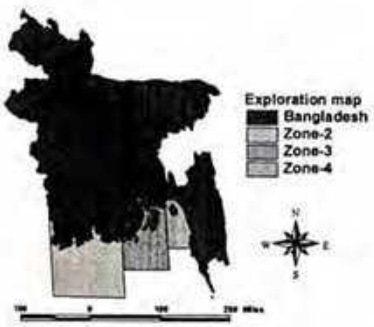
Shape	Airport	Status	X	Y
Point	Dhaka	International	90.33	23.72
Point	Chittagong	International	91.97	22.27
Point	Sylhet	Domestic	91.87	24.90
Point	Jessore	International	88.60	24.48

   Save the newly created point theme map as **'airports.shp'.**

   c. Add **districts.shp** in your view. A highway is proposed from **Dhaka** to **Chittagong** city. Create a line theme map and save it as **highway.shp** and add attributes as follows:

Shape	Highway	Length(km)
Line	Dhaka-Chittagong	280

d. Bangladesh wants to explore oil and gas in the Bay of Bengal. For this it divides the area under consideration into three zones, namely zone 1, zone 2 and zone 3. Create a new map with the help of existing map. The figures may be as shown below,



$6 + 3 + 4 + 2 = 15$

3. a. You have a shape file 'uttara.shp' representing a sector in Uttara (Each polygon represents a holding, thus there are 5257 holdings). You have also a map pole.shp representing the position of electric poles (there are 1775 poles). DESA divided their electric poles into five zones, namely zone 1, zone 2, zone 3, zone 4 and zone 5 for daily load shedding management. In the map, zones are represented in "ID" column of pole.shp map. If DESA imposes load-shedding everyday as per the following schedule:

Time	Zone
5.00 pm – 6.00 pm	1
6.00 pm – 7.00 pm	2
7.00 pm – 8.00 pm	3
8.00 pm – 9.00 pm	4
9.00 pm – 10.00 am	5

Find out, (a) How many holdings will be affected during load shedding at zone 1?

(b) How many holdings will be affected during load shedding at zone 2?

(c) How many holdings will be affected during load shedding at zone 3?

(d) How many holdings will be affected during load shedding at zone 4?

(e) How many holdings will be affected during load shedding at zone 5?

Assume, rest of the holdings has no electric line (vacant plot).

b. Bangladesh government wants to construct a new airport in Bangladesh (add upazilla.shp). The feasibility study gives five possible locations that are suitable for airport construction (add newairport.shp). The upazilla wise population is given in **totalpop** column. Which location (district) is most suitable for the new airport? For most suitable location for the airport assume, (i) government has to acquire an area with 20 miles radius around the point, and (ii) minimum number of population has to be relocated..

c. The proposed elevated railway will follow the existing rail line. The path of rail line in Dhaka city is given in the shape file line.shp. There are 4 rail lines in the map namely line-1, line-2, line-3 and line-4. The Dhaka metropolitan map is also given in dhaka.shp. Find out the number of wards that cross the rail lines 1 to 4.

d. There are 91 thanas (add dhaka.shp) in Dhaka city. Create a new theme map as per the following figure and save as lake.shp.

The University of Asia Pacific
Department of Civil Engineering
M.Sc. Engineering Final Examination, 18 February, 2011

Course No. CE 6110

Advanced Theory and Design of Steel Structure

Full Marks 100 Time 3 hours

The figures in the margin indicate full marks

There are EIGHT questions. Answer any SIX questions

1. Determine the maximum allowable tension for the bolted joint shown in Fig.1, based on shear and bearing or tearing, as applicable. The force is transmitted through the joint from an L4x3x1/4 to the 3/16" thick gusset plate with long leg connected to the gusset plate. All material is A36. Bolts are ½-in. A325 (standard holes) in a bearing type connection with threads not excluded from shear planes. Given: Allowable shear stress and bearing stress are 30 ksi and $1.2F_u$ respectively when threads are excluded from shear planes. These values are 21 ksi and $1.2F_u$ respectively, if threads are not excluded from shear planes. Allowable stress of $1.2F_u$ in bearing is applicable when end distance L_e and between connector spacing L are at least 1.5d & 3d respectively, where d is the diameter of bolts. 16 ⅔

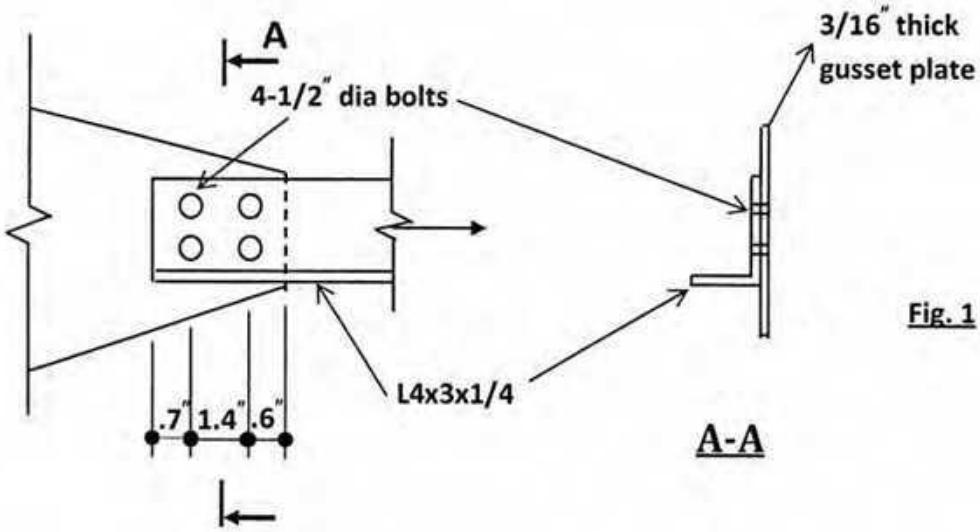


Fig. 1

2. Calculate the probable net areas for the tension splice shown in Fig.2 and hence find the net area that governs the splice design. All material is A36 steel. Bolts are 3/4-in. A325 (in standard holes) in a bearing type connection with threads excluded from shear planes. Also determine the allowable load in tension based on area of the plates only (capacity in shear, bearing of bolts or block shear is not required) using AISC/ASD method. Given U=1. 16 ⅔

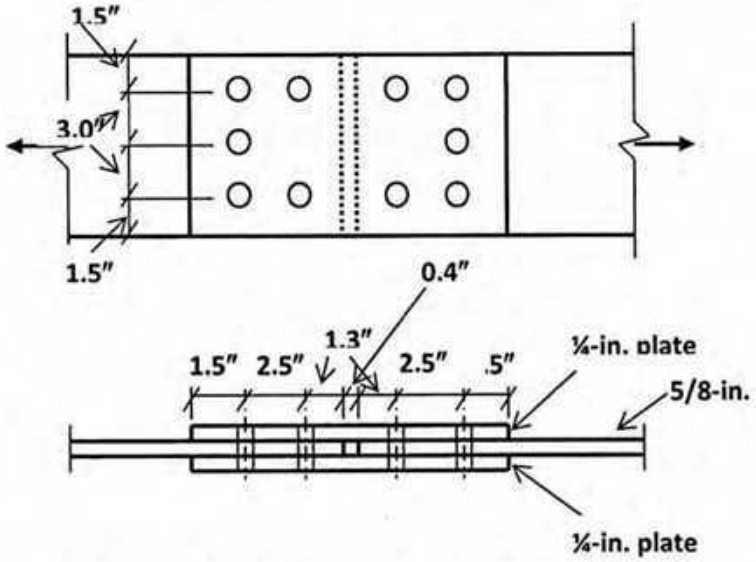
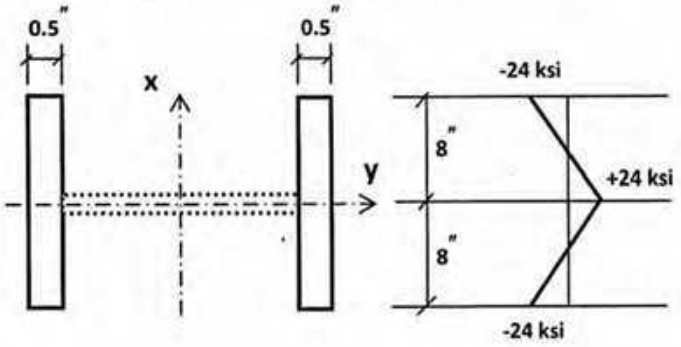


Fig. 2

3. The residual stress distribution in flanges of a webless H section of a column is shown in Fig. 3. Determine the slenderness ratio, L/r_y for minor axis buckling based on effective moment of inertia, if the column buckles at an imposed compressive strain of -0.0008 in/in. Given: E = 30000 ksi; F_y = 42 ksi. 16 ⅔



Residual Stress

Fig. 3

4. A W10x54 section as shown in Fig.4 is used for a 15 ft. long column. The section has an area of 15.8 in^2 and a radius of gyration, r_y = 2.56 in. about the weak axis Y. If K=1 for both X and Y axes, calculate the allowable load P for the column using AISC/ASD method. Given: F_y = 36 ksi and E = 29000 ksi. 16 ⅔

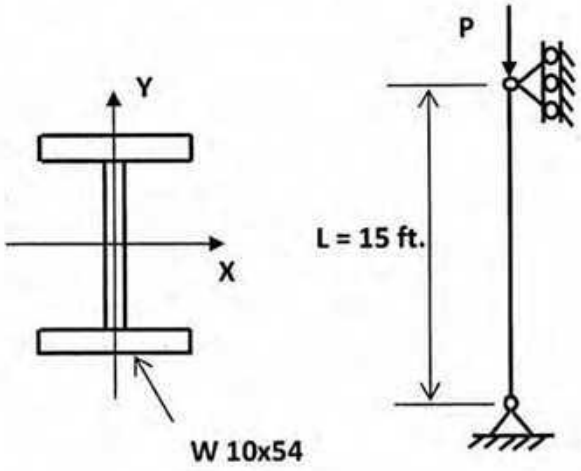


Fig. 4

5. Determine the effective length coefficients for the columns of the frame shown in Fig. 5. The moments of inertia for members in inch^4 are shown in parentheses on the members. The correction factors for beam stiffnesses with far end of the beam hinged are 1/2 with sidesway and 3/2 without sidesway. Annexure provides necessary nomographs. 16 ⅔

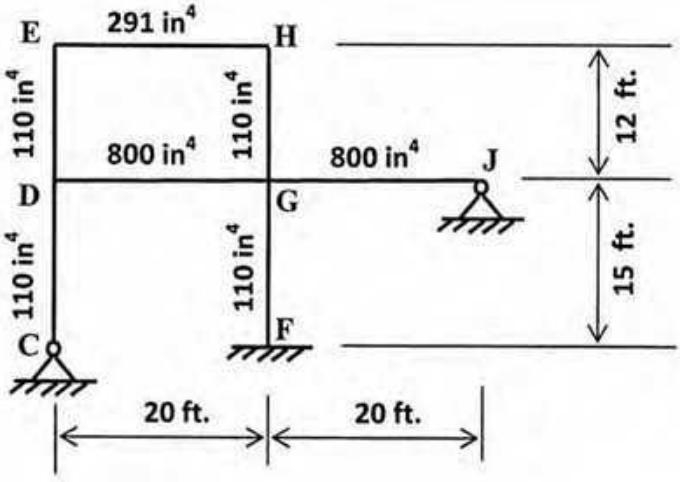


Fig. 5

6. Evaluate the yield moment, plastic moment and the shape factor for a rectangular section of width 12" and depth 18". Given F_y = 42 ksi. 16 ⅔

7. The residual stress for a 12x1-in. plate to be used as a tension member is shown in Fig. 6. Determine the load and the average stress at an imposed tensile strain of 0.0012 in/in. Given: F_y=42 ksi; E=30000 ksi. 16 ⅔

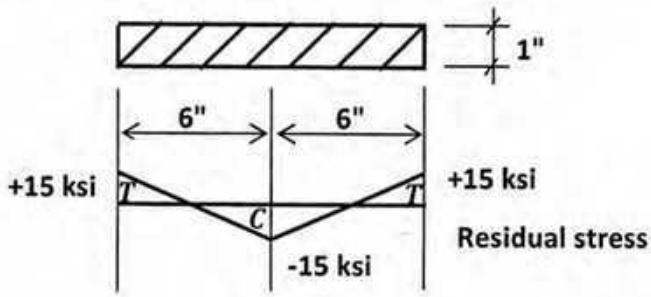
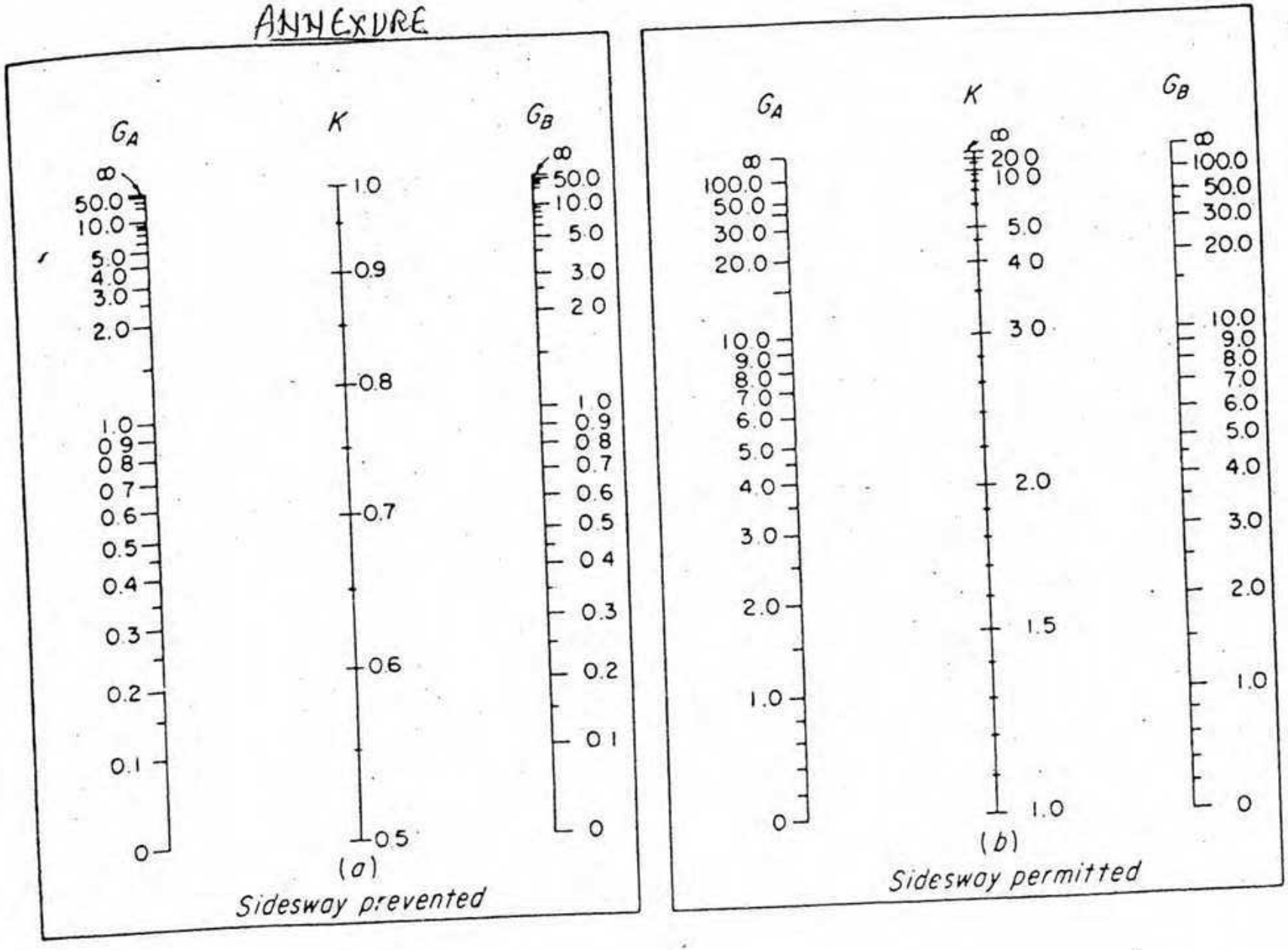


Fig. 6

8. Write down the AISC allowable bending stress formulae for channels and I-shaped members of steels with $F_y \leq 65$ ksi, supported against lateral buckling and bent about the major axis. What are the lateral support spacing requirements for beams designed for compact section allowable stress. 16 ⅔

ANNEXURE



Nomograph for effective length of columns

The University of Asia Pacific
Department of Civil Engineering

Semester Final Exam of Fall 2010 on the day of 26th February 2010

Course: CE6704 Earthquake Hazard and Risk Analysis

Time: Three Hours **Marks: 50**

Answer all the questions.

1. How does an earthquake occur? **(1)**
2. Differentiate between MAGNITUDE and INTENSITY. **(2)**
3. Explain elastic rebound theory? **(2)**
4. Narrate major types of lithospheric plate boundaries. **(1)**
5. Differentiate between: a) focus, b) epicenter, c) epicentral distance, d) focal distance, and e) focal depth. **(2)**
6. Define a fault and mention the types of faults with neat sketches. **(2)**
7. Define Wadati-Benioff zone and classify earthquakes from focal depth's perspective. **(1)**
8. Define "focal mechanism solution". **(1)**
9. Show types of focal mechanism solutions with corresponding fault types? **(2)**
10. Explain the characters of various seismic waves. (1).
11. How would you characterize seismic waves in a seismogram? **(1)**
12. What are the average seismic velocities of waves in the crust and the upper mantle? **(1)**
13. Differentiate between "Broad-band seismograph" and "High frequency seismograph". **(2)**
14. Explain isoseismal map and its utility. **(2)**
15. Define PGA and its application. **(2)**
16. What are the procedures for calculating Richter local magnitude (M_L)? **(2)**
17. Differentiate between "Surface wave magnitude" and "Body wave magnitude". (1)
18. Explain the reason why "surface wave magnitude" and "body wave magnitude" are determined for different earthquakes. **(2)**
19. Explain moment magnitude (Mw) with its important characters. **(2)**
20. Explain wave attenuation. **(1)**
21. Show the quantitative relationship of seismic energy (E_s) with surface-wave magnitude (Ms) and body-wave magnitude (m_B). **(2)**
22. Define ground motion parameters and its types. **(1)**
23. Write a brief note on "Response Spectra". **(2)**
24. Differentiate between "ground motion amplification" and "liquefaction". **(1)**
25. Explain are the factors on which a building reacts to ground motion? **(2)**
26. Damage from modern earthquakes mostly occurred in the areas underlain by soft soils—what are the reasons? **(1)**
27. Explain the reasons for branding Bangladesh as an earthquake prone country? **(1)**

28. Write about the most distinguishing features and events produced due to 1897 Great Assam Earthquake and 1999 Chi Chi earthquake. **(2)**

29. What essential seismogenic factors to be fulfilled for the formation of a tsunami? **(2)**

30. From the given earthquake data and data in the Table below, **(3+2)**

Calculate:

i) "Seismic Moment (M_0)",

ii) Moment magnitude (M_w) where seismic moment (M_0) is expressed in Nm.

Density of the crust	'ρ' = 2.7 g/cc
P-wave velocity	Vp = 6 km/sec
Focal depth	h = 10 km
Epicentral distance	Δ = 32 km
Hypocentral distance	$r = \sqrt{(h^2 + \Delta^2)}$ = ?
Incidence angle	i = arc cos (h / r)
Free surface amplification	S_a for P waves = ?
Average radiation pattern	Θ = 0.64 for P waves.
Low frequency level	$u_o = 5 \times 10^{-5}$

Table for determining Sa:

i	S_a	i	S_a	i	S_a
0	2.00	30	1.70	60	1.02
5	1.99	35	1.60	65	0.90
10	1.96	40	1.49	70	0.79
15	1.92	45	1.38	75	0.67
20	1.86	50	1.26	80	0.54
25	1.79	55	1.14	85	0.35

Course teacher

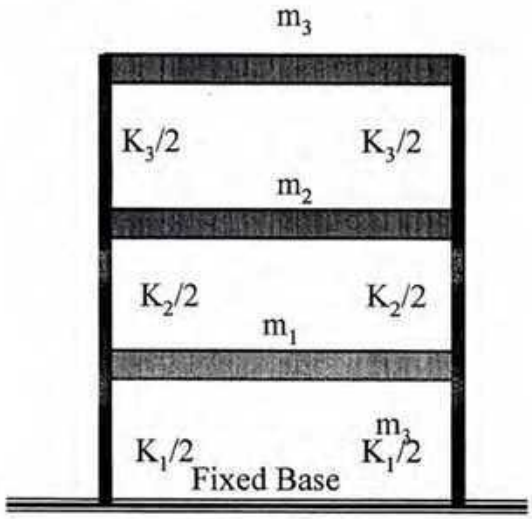
Prof. Dr. Aftab Alam Khan

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: Masters in Civil Engineering (MCE)

Course Title : Earthquake Resistant Design | Course Code: CE 6713
Time: Three Hours | Full Marks: 200

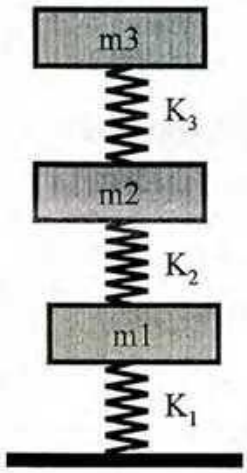
Answer ALL questions. The figures in the right margin indicate the marks of the questions.

1. Refer to the following 3-DOF system. 60



Three Storey Building

Very stiff floor slabs relative to the supporting columns.



Model – 3DOF

Given:
$m_3 = m = 50$ ton; $m_2 = 1.75$ m; $m_1 = 2.25$ m
$K_3 = K = 15{,}000$ kN/m; $K_2 = 2.5$ K, $K_1 = 3.5$ K

Soil type = S2; Seismic coefficient = 0.15; Occupancy type = Standard
Code = 1990 SEAOC; 1 kN = 1 ton.m/sec2

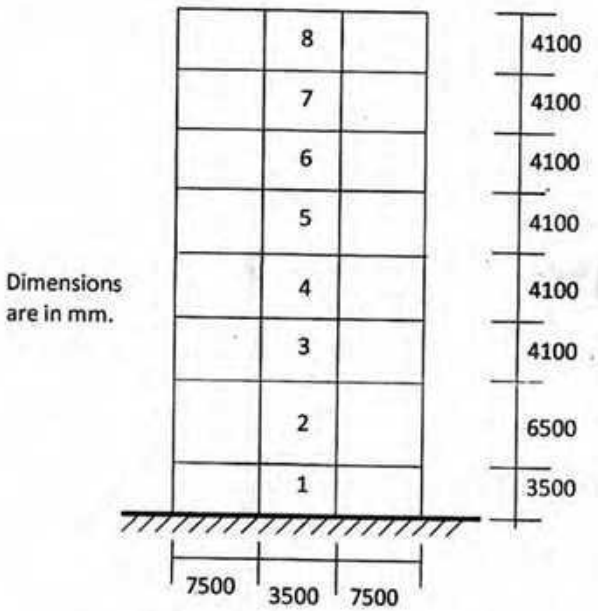
By modal analysis, determine the modal frequencies, mode shapes, equivalent modal forces, and base shear.

2. Refer to the following special moment-resisting building frame system. 60

Calculate lateral EQ forces using equivalent lateral force procedure. Also, by using Rayleigh method and top deflection method, calculate the fundamental period of the structure.

The following data are provided:

Occupancy – standard, Seismic zone – 3, Soil condition – S2, Code - SEAOC. The weight of the roof is 750 kN and that of the other floor is 1250 kN each.



Elevation of 8 -storey RC Frame

Horizontal storey stiffness of each floor

Storey No.	8	7	6	5	4	3	2	1
K x 10^3 (kN/m)	25	40	40	45	50	70	25	150

3. (a) Write short notes on the following: 12

(i) Seismic intensity
(ii) Seismic waves
(iii) Richter magnitude
(iv) Accelerograph
(v) Frequency content
(vi) Response spectra

	(b)	Explain the methodology to draw the response spectra for various damping ratio. Also, explain the application of the response spectra in real structures.	8
	(c)	Explain the main factors that may influence ground motion due to earthquake.	10
4.	**(a)**	Explain the factors associated with seismic design of structure.	15
	(b)	Explain different forms of ductility.	10
5.	**(a)**	Explain passive and active control systems that are used to control vibration of structures.	15
	(b)	"Our structures in Bangladesh are vulnerable to significant damage during a moderate earthquake" – Justify.	10

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B. Sc. Engineering (Civil)

Course Title: Chemistry | Course Code: CHEM 111
Time: 3 Hours | Full Marks: 50

There are SEVEN Questions. Answer any **FIVE.**

1	(a) What is equilibrium constant ? How the equilibrium constants Kp and Kc are related ?	5.0
	(b) At 100°C, PCl_5 dissociates to 35%. If total pressure is 1.5 atm, find Kp and Kc.	5.0
2	(a) State rate law with suitable example. Give the rate expressions of zero order, first order and second order for the process, $2A \rightarrow$ product.	5.0
	(b) Discuss (i) instantaneous rate and (ii) average rate.	5.0
3	(a) What is half-life ($t_{½}$) ? Deduce (i) the integrated rate expression and (ii) $t_{½}$ of a first order reaction.	5.0
	(b) Half-life of a first order reaction is 1000s. Find the time at which 1/10 of the reactant will be uncompleted.	5.0
4	(a) What is chemical solution? How it differs from a physical solution - discuss with examples.	5.0
	(b) What is the molarity and molality of a 20 mass % H_2SO_4 solution if its density is 1.14 g cm^{-1}.	5.0
5	(a) What is heat of neutralization ? Show that heat of neutralization of all strong acids and bases is -13.7 Kcal.	5.0
	(b) Given that energies for H-H, O=O and O-H bonds are 104, 118 and 111 Kcal mol^{-1}, respectively. Calculate the heat of reaction for the process: $H_2(g) + ½\ O_2(g) \rightarrow H_2O(g)$	5.0
6	(a) Discuss ionic bond and covalent bonds with examples.	5.0
	(b) Show that H_2SO_4 and $POCl_3$ have co-ordination bonds.	5.0
7	(a) What is D_2O ? Compare the physical properties of D_2O and H_2O.	5.0
	(b) Discuss the caustic and calgon processes for the softening of water.	5.0

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B. Sc. Engineering (Civil)

Course Title: Basic Electrical Engineering
Time: 3 Hours

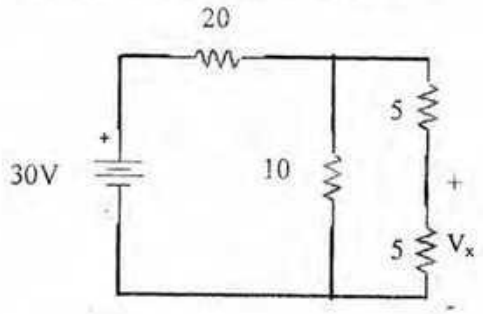
Course Code. ECE 201
Full Marks: 150

[There are **eight** questions. Answer any **six**. Figures in the right margin indicate marks]

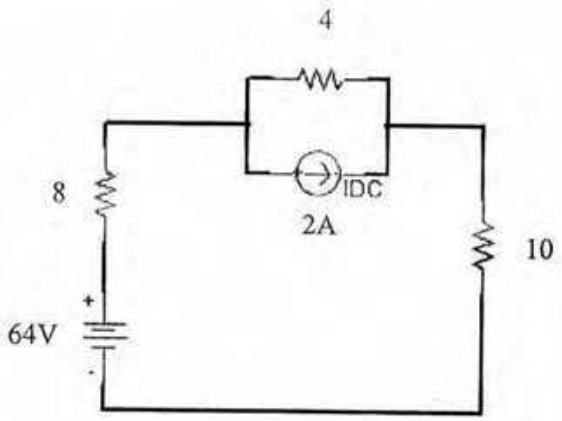
1 a. i) State KVL, KCL & Ohm's Law. 6
ii) Find out the equation of current for a straight conductor. 5

b. What do you understand by open circuit and short circuit condition? 4

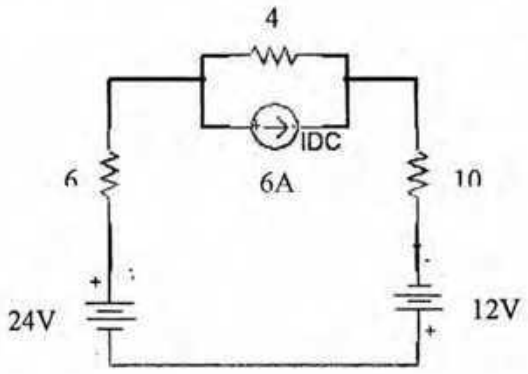
c. Find out the voltage V_x. All resistances are given in ohms. 10



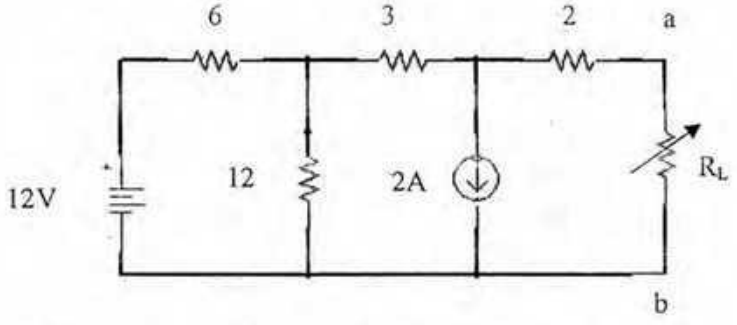
2 a. Using Nodal analysis determine the node voltages. All resistances are given in ohms. 12



b. Using mesh analysis find out the mesh currents. All the resistances are given in ohms. 13

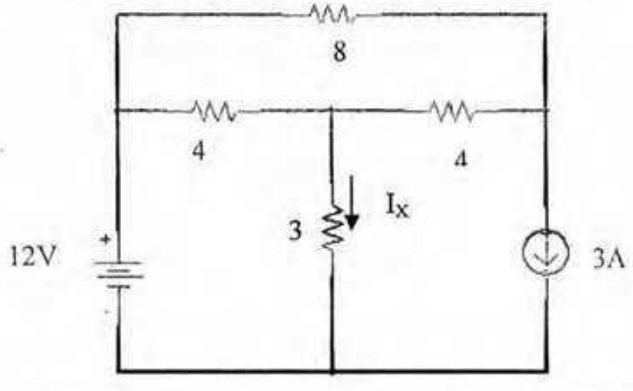


3. a. Find the Thevenin equivalent circuit at the a-b terminal and calculate the maximum power absorbed by Load R_L. All the resistances are given in ohms. 14



b. Derive Maximum Power Transfer Theorem. Draw the Power vs Load curve . 11

4. a. Using superposition theorem find the I_x . 13



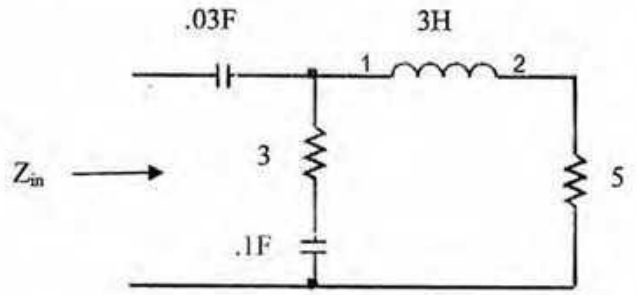
b. Prove that , A periodic function is one that satisfies $f(t) = f(t + nT)$, for all t and for all integers n. 8

c. Express the sinusoid in the phasor domain $V = 20\sin(wt - 20^0)$ 4

5. a. Calculate the phase angle between $I = -2\cos(wt - 50^0)$ and $V = 3\sin(wt - 150^0)$. Draw the corresponding waveform. 10

b. Why sinusoid function is preferred over other form of signals in the circuit analysis ? 5

c. Calculate the input impedance Z_{in} of the following circuit at w = 50 rad/s : 10



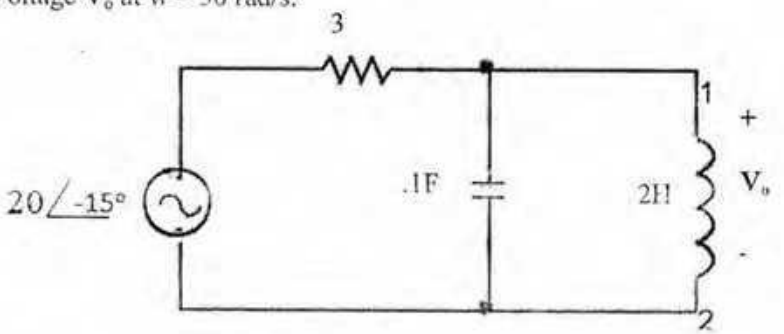
6. a. Given a sinusoid $V(t) = V_m \sin(wt + Ø)$. Derive its Phasor Representation . 6

b. Prove that for a sinusoidal signal V(t), the Phasor form of dE(t)/dt is jωV and the phasor form of $\int V(t)dt$ is V/jw . 12

c. Given i(t)= 4 cos (wt+300) and v(t) = 5 cos (wt -200). Find their sum . 7

7. a. With necessary diagram show that in a inductor "V" leads " I" by 90^0 and in a capacitor "I" leads " V" by 90^0 both in time domain and frequency domain . 14

b. Find the Voltage V_o at w = 50 rad/s. 11



8. Write down short note (any two) : 25

a. Capacitor and Inductor

b. Important terminologies to express sinusoidal waveforms

c. "At the end of 1800 century, the battle of direct current versus alternating current began. With the time passed by ac system ultimately ended up winner.." – Can you mention some reasons?

The University of Asia Pacific
Department of Civil Engineering
Final Examination Spring Semester 2010
Program: B.Sc Engineering (Civil)

Course Title: Principles of Economics | Course Code: ECN-201
Time: 2.00 Hour | Full Marks: 50

There are SIX questions. Answer any FIVE of the following Questions (No. 1 - 6)

1. a) Define 'input' and 'output' in context of economic production analysis. *[2+5+3]*
   b) Discuss the 'law of diminishing marginal return'.
   c) Distinguish between shortrun and longrun analyzing framework of economics

2. a) Define 'marginal product' and 'marginal cost' with numerical examples. *[5+5]*
   b) Distinguish between economic cost and accounting cost.

3. a) What is market equilibrium? Explain with a figure. *[4+4+2]*
   b) What do you understand by the terms 'price flooring' and price ceiling'?
   c) Draw an initial equilibrium of the cement market of Bangladesh and then show the effect of increased suppliers' competition in that market.

4. a) Discuss the law of demand with some of its exceptions. *[5+5]*
   b) When price of a commodity increases from tk. 500 to tk. 550 per unit, its demand falls from 20,000 to 18,000 units.
      (i) Calculate the price elasticity of demand,
      (ii) If the full demand is met in both cases, what is the effect on revenue?

5. Discuss the role of the civil engineers in the economic development process of a least developed country like Bangladesh. *[10]*

6. Write short notes on any FOUR of the followings *[2.5*4]*
   a) Cross elasticity of demand;
   b) Return to scale;
   c) Productivity;
   d) Economy of scale;
   e) Determinants of demand and supply.

Marks Obtained	
..... *Signature of Examiner with date*	

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Progam: B.Sc. Engineering(Civil)

..... *Signature of Invigilator with date*

Course Title: English Language-1
Time: 3 hours

Course Code: HSS 101
Full Marks: 100 (50)

Name: .....

Registration no.:.....

Department: .....

Section –A

(Answer all the questions of this section on the question paper)

Q.1. Read the passage and then answer the questions about the passage below.

Africa is the second–largest continent after Asia. There are about 2,000 different languages in Africa. Most of the languages belong to one of four large language groups. The four large language groups are Afro-Asiatic, Nilo-Saharan, Niger-Congo, and the Khoisan languages. There are many different tribes and cultures in Africa. For example, there are the Ashanti people. They live in Ghana. They are famous for their beautiful Kente cloth. Kente cloth can be of different colours. Ashanti people wear clothing made of Kente cloth for important events. Most scientists think that the first humans came from Africa. The first written information in Africa comes from Egypt at around 3300 B.C.E. (Before the Common Era). In the late 1800s, European countries went to Africa. France, Britain, Portugal, Germany, Belgium, Spain, Italy, and Algeria made colonies in Africa. That means they controlled the governments there. The European powers took land by force. This enabled them to send many raw materials home to their countries. Raw materials are resources that are basic, and have not been made into anything else. After the colonial powers left, there were problems with government. Between 1960 and 1980, there were 70 coups. (pronounced "koo") A ***coup*** *is the overthrow of a government. There were 13 presidential assassinations. In the 1970s, there was a huge* ***famine*** *in Ethiopia. A famine is a time of little or no food. Hundreds of thousands of people died of* ***starvation****, which means they died of hunger. There have been wars. There has been a big conflict in Darfur, Sudan, and many people have died. And the AIDS (Acquired Immunodeficiency Syndrome) disease has caused much sickness and death in post–colonial Africa. Africa has many natural resources. There are eight oil exporting countries in Sub–Saharan Africa. Mozambique, Cameroon, Equatorial Guinea, Gabon, Ghana, and Liberia all have a lot of* ***timber****, which is wood. The business in gas, oil diamonds, timber and tourism is very good. Many tourists visit Kruger National Park in South Africa. The park has 517 species of birds! The park also has 147 species of mammals! Some tourists go on* ***safari*** *in Africa. The word "safari" means travel. It is a trip where people can watch and take pictures of animals.*

Soccer is the most popular sport in Africa. The Confederation of African Football (CAF) is the organization in charge of soccer. The CAF is the biggest of the six continental soccer associations around the globe, and the African Cup of Nations is the main contest for men's national soccer teams in Africa. The continent of Africa is rich with resources, people and culture. Unfortunately, this has contributed to its ***chaotic*** *history. Africa is currently working on increasing education and jobs. Many organizations are working together to build schools, hospitals, and industry to improve the future of the African nation.*

a. Answer the following questions in two sentences. **10**

1) **How many large language groups are there in Africa? What are they?**

2) **Where does Kente cloth come from? Who wears these clothes and why?**

3) **Which country had colonies in Africa? What do the countries do after colonizing Africa?**

4) **How many different kinds of birds can be found in the park? Describe the park.**

5) **What do you know about African soccer?**

b. Tick on the correct answer **3**

1) A ***coup*** is...
A. a government takeover.
B. a group of people.
C. a colonial power.
D. a refugee.

2) A ***famine*** is ...
A. a time without food.
B. a peaceful change.
C. a time of extreme conflict.
D. a family group.

3) What is *starvation*?
A. War
B. Hunger
C. Industry
D. Freedom

4) Where does *timber* come from?
A. Oil
B. Trees
C. Mines
D. Factories

5) A ***safari*** is a...
A. trip.
B. tour.
C. search.
D. Both A and C are correct.

6) If something **is *chaotic* it is...**
A. carefully organized.
B. sick and diseased.
C. crazy and demented.
D. turbulent and disorderly.

c. Write T for true F for false. 7

a. The first written information in Africa comes from Algeria.

b. European countries controlled the governments of the colonized countries.

c. During famine people have plenty of food.

d. AIDS has caused death in pre-colonial Africa.

e. There are a lot of birds of the same group in Kruger National Park.

f. Soccer is the most popular sport in Africa.

g. The European took land to improve the condition of African people.

Q.2. Fill in the blanks with appropriate parts of speech. (Any five) **10**

1. It happens only ----------(rare) in life and we are normally ----------(conscious) of it

2. ----------(garden) is his favorite pastime and he has all the necessary----------(equip)

3. They purchased a new ----------(air condition) last month which was very----------(cost)

4. Their ----------(repute) was at stake because of their ----------(sincere)

5. The increased----------(occur) of----------(thief) in classroom has been referred to the Principal

5. The sudden---------- (appear) of the film star caused a lot of---------- (disturb) during the annual day function

Q.3. In each sentence there are two words in phonetic script. Write in the words. 10

a. When I ---------- /mi:t / my friend I'm going to ask her about the dish she prepares with ---------- / mi:t /.

b. As soon as you ---------- / fi:l / okay, you need to ---------- / fil / the bucket with water.

c. He ran ---------- / beə(r) / footed when he saw the ---------- / beə(r) / coming.

d. She needs to ---------- / sel / her ---------- / sel / phone.

e. She always ----------/ preɪz / to God whenever she wants to ----------/ preɪz / Him.

f. He ----------/ eɪt / rice with milk when he was ----------/ eɪt /.

g. The team ---------- / wʌn / because ---------- / wʌn / of their players played really well.

h. He ----------/ mɪst / the train as he couldn't drive his car in thick ----------/ mɪst /.

i. Please ----------/ reɪz / the curtains and let in the ---------- / reɪz /of sun.

j. He was ----------/si:n/ with the thief in the crime ----------/si:n/.

Q.4. Use *a little, anyone, somebody, somehow, anything, many, a, an, the, some,* etc. to fill in the blanks. **5**

a. I think I heard ---------- walking on the stairs, but I can't see ----------.

b. I need to work -------- the weekends because there's hardly------- money left.

c. I live in---------- small village in ---------- mountains in Switzerland.

d. Please find ---------- who can help you with ----------problem.

e. It's --------- very simple puzzle. ---------- can solve it.

Section –B

(Answer all the questions on the answer script)

Q.5. Add one prefix with any ten of the following words and make a sentence with each of the new words. **10**

Un-, under-, re-, dis-, for-, il-, mis-, over-, in-, en-, pre-, post-, ir-

Organize, commend, logic, behave, complete, war, responsible, ever, connect, emphasize, active, mine

Q.6. Write two sentences with any five (ten sentences) of the following words giving their two different meanings. **10**

beat, desert, account, fast, space, file, branch

Q.7. The following extract has some misspelled words. Find them out and write them correctly. **5**

Hunger and mallnutrition may soon hit the world's largest and poorest citys. This was the dire warning from the United Nations on February 25th. Josette Sheeran, head of the UN's World Food Programme (WFP) warned that sky-rocketing food and oil prices are making it very hard for the organizasion to feed the world's poorest people. Food prices have raisen by up to 40 percent in the past year. Ms Sheeran told reporters that spiralling global inflaetion has created a "new face of hunger". She gave the bare and basic facts that the UN no longer had enough money to feed the world's hungry. "We will have a significant gap if comodity prices remain this high, and we will need an extra half billion dollars just to meet exhisting...needs," she said. The WFP feeds less than one tenth of the world's hungry and sturving. That figure will greatly decrease if prices continue to escalat.

Section -C

(Answer any three from the following on the answer script) **3x10=30**

Q.8. Compare and contrast any two fairs you have visited. (200 words)

Q.9. Describe the school where you had studied. (250 words)

Q.10. Write a letter to your friend inviting him/her to a picnic. (250 words)

Q.11. Translate the following paragraph into English.

জর্জ ওয়াশিংটনের জন্ম যুক্তরাষ্ট্রের ভার্জিনিয়া নামক একটি স্থানে যেখানে তাঁর পরিবারের একটি বিরাট খামার বাড়ি ছিল। সেখানে তাদের অনেক দাসও কাজ করত। জর্জ পড়াশুনার খুব একটা সুযোগ পাননি এবং তিনি তাঁর জীবনে কৃষক, সৈণ্য এবং রাজনীতিবিদ এই তিনটি পেশায় নিযুক্ত ছিলেন। কিন্তু তিনি কৃষকের পেশাই বেশী পছন্দ করতেন এবং তামাক চাষ করতেন। তিনি খুব পরিশ্রমী হলেও নাটক দেখতে পছন্দ করতেন। ১৭৫৯ সালে তিনি মার্থা কার্টিস নামের একজন বিধবাকে বিয়ে করেন। তাঁদের বিবাহিত জীবন খুবই সুখের ছিল যদিও তাঁদের কোন সন্তান ছিলনা।

The University of Asia Pacific
Department of Architecture/ Business Admin/ CE/ CSE/ Pharmacy
Final Examination Fall-2010
Program: B Arch/ BBA/ B.Sc Engineering/ B Pharm

Course Title: English Language II | Course Code: HSS 103 | Credit: 3 .00
Time: 3.00 Hours | Full Mark: 100 (50)

1. Read the following passage and answer the questions that follow:

Exports

Exports are either raw materials or manufactured goods. Raw materials are products of the land, such as cotton, timber or rubber. Some raw materials such as iron ore come from mines. These raw materials are often exported by the countries that produce them to other countries where they are made into manufactured goods.

Some countries produce food for export, for example, meat, sugar or cereals such as wheat and rice. These countries are agricultural countries. An agricultural country needs fertile land and a good climate. A cold, wet climate is also suitable for agriculture.

A country which produces manufactured goods is known as an industrialized country. An industrialized country cannot always produce enough food for its own needs. In this case it does not export foodstuffs, of course. It has to import them. It relies on exports of manufactured products and pays for imports with the money it earns from the exported goods.

a) Are these statements true or untrue: **08**

1) No country can export manufactured goods.
2) An industrialized country exports only food.
3) Cereals and meat are foodstuffs.
4) Industrialized countries always produce enough food for their needs.
5) A country without enough food has to import it.
6) Some industrialized countries rely on their exports for food.
7) Countries pay for goods with their earnings from exports.
8) Countries earn money by their imports.

b) Answer any **six (06)** of the following questions: **12**

1) What kind of land does an agricultural country need?
2) What kinds of things are exported by an agricultural country?
3) What are raw materials?
4) What kind of country imports raw materials?
5) Do industrialized countries always produce enough food for their own needs?
6) How do industrialized countries pay for their imports?
7) Is a warm climate or a cold climate better for agriculture?
8) What kind of things do agricultural countries import?

2. Rewrite any **ten (10)** of the following sentences using appropriate modal verbs: **10**

a) There is a possibility of his coming today.
b) We cannot but follow the rules of the game.
c) I was in the habit of walking on the beach every morning when I was at Cox's Bazar.
d) He is able to speak four languages.
e) You are permitted to give your opinion.
f) It is suggested that you do your tasks on time.
g) I wish that you do well in the examination.
h) I am obliged to look after my parents.
i) You have the necessity to make a passport.

j) Do you allow me to ask you a question, sir?
k) When the ship was upset, we were able to swim to the bank.
l) I advise you to take care of yourself.

3. Join any **ten (10)** of the following pairs of sentences with appropriate conjunctions or relative pronouns. Do not use the same joining word more than once: **10**

a) I saw this man yesterday. He was going to his office.
b) I must finish the task today. I will miss the deadline.
c) I believe him. He is trustworthy.
d) I will attend the wedding. I will go home.
e) The man filed a case. He was cheated.
f) He is a good student. He is a good player.
g) We had some problems. We had to borrow some money.
h) I couldn't understand what he said. His voice was too low.
i) We stay in the house. This needs to be renovated.
j) Joy wants to be a good player. He doesn't practise well.
k) The magic show is going on. People don't watch it.
l) He'll offer his help. I don't need it.

4. Write single sentence definitions any five (5) of the following words: **10**

a) Library (function) b) Computer (negation) c) Fascinate (synonym)
d) OHP (class) e) Octopus (description) f) Dictatorship (class)
g) Newspaper (function)

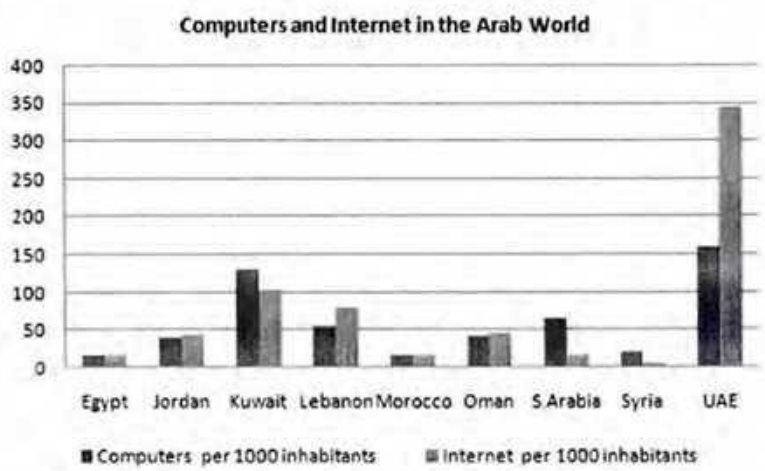
5. Write a letter to the Registrar of your university seeking financial help to organize your departmental picnic.
Or, Write a letter to your best friend inviting him/her to visit your village after the final examinations. **10**

6. UAP will organize 'Inter-Departmental Debate and Cultural Festival 2011' soon. As the convener of UAP Organizing Committee for the Festival, write a memorandum to this effect. **10**

7. UAP has recently arranged its annual sports. As a reporter of a national daily, write a news-report on the event for publication in your newspaper. **10**

8. Write a paragraph on any one (1) of the followings (word limit 130 words) **10**
a) What If I Were a Teacher; b) World Cup Cricket 2011;
c) The Television Programmes You Like/Dislike

9. The bar chart below shows information about use of computer and internet in the Arab World. Describe and analyze the information available in the chart in your own words. **10**



The University of Asia Pacific
The Department of Interdepartmental Courses
Semester Final Examination, Fall 2010
Programmes: BArch and BSc Engineering (Civil, Computer Science, Electrical and Electronic)

Course Title: Bangladesh Studies: Society and Culture **Course Code: HSS 111(a)**
Credit: 2.00 **HSS 211(a) [for CE]**

Time: 2 Hours **Full Marks: 100**

There are two sections in the question paper namely "SECTION A" and "SECTION B". You have to answer from both sections according to the instruction mentioned in each section.

SECTION A

There are **FIVE** questions in this section. Answer **ANY FOUR** (4x20)

1. Define social stratification. Discuss its characteristics. Discuss in brief on slavery and estate.
2. Discuss rural stratification pattern of Bangladesh in terms of land and power.
3. How is marriage and family related? Discuss the types of marriage and family with examples.
4. Discuss the economic arrangements in industrial societies.
5. Define political institution. Discuss the types of governments with examples. What are the functions of government?

SECTION B

There are **FIVE** topics in this section. Write short notes on **ANY FOUR** (4x5)

6. Difference between class and caste
7. Over urbanization
8. Functions of family
9. Traditional professional groups and Ethnic groups
10. Any social problem you worked on **OR** the Bengali Culture

The University of Asia Pacific

The Department of Civil Engineering (CE)

Final Examination, Fall 2010

Programme: CE

Course Title: Bangladesh Studies: History of Bangladesh Course Code: HSS 211(b)
Credit: 2.00

Time: 2 Hours **Full Marks: 100**

There are two sections in the question paper namely "SECTION A" and "SECTION B". You have to answer from both sections according to the instruction mentioned in each section.

SECTION A

There are **FIVE** questions in this section. Answer ANY **FOUR** (4x20)

1. Describe the background of the Battle of Palashi.
2. Discussed an overviewed of the permanent settlement.
3. Who was Ishwar Chandra Vidyasagar? Describe his contribution social and religious reforms.
4. Discuss about six points. What was the importance of six point's movement in the history of Bengal?
5. Narrate the help of the other countries of the world during the liberation war of Bangladesh in 1971. What was the historical significant of liberation war of Bangladesh?

SECTION B

There are **FIVE** questions in this section. Answer ANY **FOUR** (4x5)

1. Robert Clive
2. Historical 7th March Address of Bangabandhu Seikh Mujibur Rahman
3. Bengal Renaissance
4. Titu Meer
5. Language Movement

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program: B.Sc Engineering (Civil)

Course Title: Principles of Management | Course Code: IMG 301
Time: 2 hours | Full Marks: 60

Choose any four (4) of the following 5 questions.

1. (a) Discuss the forms of Interdependence. (5)
   (b) Discuss grouping jobs and common bases for departmentalization with examples. (10)

2. (a) What is Span of Management? With examples describe Graicunas's observation regarding Span of Management. (10)
   (b) What is chain of command? (5)

3. (a) Explain the purposes of Goals. (5)
   (b) What are the various types of organizational plans and discuss time frames for planning. (10)

4. (a) What is Tactical planning? How you develop Tactical plan? (7)
   (b) What is a Strategy? How you use SWOT Analysis to formulate Strategy? (8)

5. Write short notes on: (5 x 3 = 15)
   (a) Difference between Line and Staff positions.
   (b) Socio-cultural dimension of general environment.
   (c) Management process.

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program : B.Sc Engineering (Civil)

Course Title: Mathematics I
Time: 3 hrs

Course Code: MTH-101
Full Marks: 150

There are two sections in the question paper namely "***SECTION A***" and "***SECTION B***". You have to answer from both sections according to the instruction mentioned in each section

SECTION A

There are **FOUR** questions in this section. Answer any **THREE**.

Q1. (a) State and prove Rolle's theorem. 12.5

(b) Verify this theorem for the function $f(x) = e^x \sin x$ on $(0, \pi)$. 12.5

Q2. (a) State and prove Lagrange's Mean value theorem (MVT). 12.5

(b) Verify this theorem for $f(x) = x^3 + x - 4$ on the interval [-1, 2]. 12.5

Q3. (a) Find the nth derivative of $f(x) = e^{4x} \cos 3x$. 8

(b) State and prove Leibniz's theorem. 8

(c) If $y = \sin(m \sin^{-1} x)$, then show that 9

(i) $(1-x^2)y_2 - xy_1 + m^2 y = 0.$

(ii) $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} + (m^2 - n^2)y_n = 0.$

Q4. (a) Let $f(x) = x^3 - x^2 + 2$. Find the intervals on which the function $f(x)$ is increasing, decreasing, concave up and concave down. 12.5

(b) Find the local extrema of $f(x) = x^4 - 8x^3 + 22x^2 - 24x + 5$. 12.5

SECTION B

There are **FOUR** questions in this section. Answer any **THREE**.

Q5. (a) State Taylor's theorem with remainder. Use Taylor's theorem to expand $f(x) = \sin x$ in powers of x with the remainder term. 12.5

(b) State and prove L'Hopital's rule. Apply this rule to evaluate 12.5

$$\lim_{x\to 1}\left(\frac{x}{x-1}-\frac{1}{\ln x}\right).$$

Q6. Integrate the following 25

(i) $\int\frac{(\sin^{-1}x)^2}{\sqrt{1-x^2}}dx$ (ii) $\int\frac{dx}{\left(e^x+e^{-x}\right)^2}$ (iii) $\int\frac{\sin x\cos x}{\cos^4 x+\sin^4 x}dx$ (iv) $\int\frac{dx}{\sqrt{2x^2+3x+4}}$

(v) $\int\frac{dx}{\sqrt{(x-2)(3-x)}}$.

Q7. (a) State the fundamental theorem of calculus. 5

(b) Evaluate (i) $\int_0^{\frac{\pi}{2}}\frac{dx}{3+2\cos x}$ (ii) $\int_0^1\frac{dx}{3+x^2}$. 20

Q8. (a) Find the area of the region enclosed by the curves $y^2 = 4ax$ and $x^2 = 4ay$. 9

(b) Find the area of the region bounded by $x^2 = y,\quad x = y-2$. 8

(c) Find the area of the region bounded by $4x^2 = y,\quad y = 2x-4$. 8

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program : B.Sc Engineering (Civil)

Course Title: Mathematics II
Time: 3 hrs

Course Code: MTH-103
Full Marks: 150

There are two sections in the question paper namely "***SECTION A***" and "***SECTION B***". You have to answer from both sections according to the instruction mentioned in each section

SECTION A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) If a sphere passes through the points (1, -3, 4), (1, -5, 2) and (1, -3, 0) and whose centre lies on the plane $x + y + z = 0$ then find the equation of the sphere. 15

   (b) Find the equation of the sphere which passes through the circle $x^2 + y^2 + z^2 - 2x + 2y + 4z - 3 = 0,\ 2x + y + z - 4 = 0$ and touches the plane $3x + 4y - 14 = 0$. 10

2. (a) Determine the three planes through the intersection of the planes $x + y + z = 1$ and $2x + 3y - z + 4 = 0$ which are parallel to the three co-ordinates axes. Also find the equation of the plane perpendicular to the yz- plane i.e. parallel to x-axis and passing through the points (2, 3, 1) and $(4, -5, 3)$. 15

   (b) Determine the constant k, so that the planes $x - 2y + kz = 0$ and $2x + 5y - z = 0$ are at right angles, and find in that case the plane through the point $(1, -1, -1)$ and perpendicular to both the given planes. 10

3. (a) Define unit vector, rectangular unit vectors and vector field. The angles α, β and γ which the vector $\underline{r} = x\hat{i} + y\hat{j} + z\hat{k}$ makes with the positive directions of the coordinate axes. Show that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$. 10

   (b) Prove that if a, b and c are non- coplanar then $xa + yb + zc = 0$ implies $x = y = z = 0$. 6

   (c) Find the equations for the straight line passing through the points $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$. 9

4. (a) Define Scalar and Vector product. 6

   (b) Prove that $\underline{A}.(\underline{B} \times \underline{C}) = \underline{B}.(\underline{C} \times \underline{A}) = \underline{C}.(\underline{A} \times \underline{B})$. 10

   (c) If $\underline{A} = \hat{i} - 2\hat{j} - 3\hat{k}$, $\underline{B} = 2\hat{i} + \hat{j} - \hat{k}$ and $\underline{C} = \hat{i} + 3\hat{j} - 2\hat{k}$ then find $|\underline{A}.(\underline{B} \times \underline{C})|$. 9

SECTION B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Prove $\underline{\nabla} \times (\underline{\nabla} \times \underline{A}) = -\underline{\nabla}^2 \underline{A} + \underline{\nabla}(\underline{\nabla}.\underline{A})$. 10

(b) Evaluate $\underline{\nabla}.[r\underline{\nabla}(1/r^3)]$. 10

(c) Evaluate $\underline{\nabla}.(\underline{A} \times \underline{r})$ if $\underline{\nabla} \times \underline{A} = 0$. 5

6. (a) Define line integrals, surface integrals and volume integrals with examples. 9

(b) If $\underline{A} = (2y+3)\hat{i} + xz\hat{j} + (yz - x)\hat{k}$, evaluate $\int_C \underline{A}.dr$ from (0, 0, 0) to (1, 1, 1) along the following paths C:

(i) $x = 2t^2$, $y = t$, $z = t^3$ from $t = 0$ to $t = 1$.

(ii) the straight lines from (0, 0, 0) to (0, 0, 1), then to (0, 1, 1) and then to (2, 1, 1).

(iii) the straight line joining (0, 0, 0) and (2, 1, 1) 16

7. (a) Evaluate $\iint_S \underline{A}\hat{n}\,dS$ by taking a projection, where $\underline{A} = 18z\hat{i} - 12\hat{j} + 3y\hat{k}$ and S is that part of the plane $2x + 3y + 6z = 12$ which is located in the first octant. 15

(b) Let $\phi = 45x^2y$ and let V denote the closed region bounded by the planes $4x + 2y + z = 8$, $x = 0$, $y = 0$, $z = 0$ evaluate the integral $\iiint_V \phi\,dV$. 10

8. (a) Verify Green's theorem in the plane for $\oint_C (xy + y^2)dx + x^2dy$ where C is the closed curve of the region bounded by $y = x$ and $y = x^2$. 15

(b) If $\underline{A} = 4xz\hat{i} - y^2\hat{j} + yz\hat{k}$ and evaluate $\iint_S \underline{A}\hat{n}\,dS$ where S is the surface of the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$. 10

THE UNIVERSITY OF ASIA PACIFIC
Department of Interdepartmental Courses
Final Examination Fall-2010
Program: B.Sc. Engineering (Civil)

Course Title: Mathematics -III | Course Code: MTH-201
Time: 3.00 Hrs. | Full Marks: 150

There are two sections in the question paper namely "***SECTION A***" and "***SECTION B***". You have to answer from both sections according to the instruction mentioned in each section

SECTION A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Define invertible matrix. Find A^{-1} of the matrix $A = \begin{pmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{pmatrix}$ by elementary row operations. Verify your result. 15

(b) Define subspace of a vector space. Determine whether or not the subset $W = \{(a,b,c,d) | a+b=0, c+d=0\}$ is a subspace of $\mathbb{R}^4$. 10

2. (a) Prove that the of vectors $(2,1,1)$, $(3,-4,6)$ *and* $(4,-9,11)$ is linearly dependent in $\mathbb{R}^3$. 12

(b) Let V be the vector space of 2X2 matrices over the real field $\mathbb{R}$. Find the basis and the dimension of the subspace W of V spanned by the matrices

$$A=\begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix},\ B=\begin{bmatrix} 1 & 1 \\ 2 & 2 \end{bmatrix},\ \text{and } C=\begin{bmatrix} 2 & 3 \\ 3 & 4 \end{bmatrix}. \quad 13$$

3. (a) Write the matrix $A=\begin{bmatrix} 3 & 1 \\ 1 & -1 \end{bmatrix}$ as a linear combination of the matrices

$$A_1=\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}, A_2=\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix} \textit{ and } A_3=\begin{bmatrix} 0 & 2 \\ 0 & -1 \end{bmatrix}. \quad 15$$

(b) Define linear transformation. Determine whether or not the transformation $T: \mathbb{R}^2 \to \mathbb{R}^2$ defined by $T(x,y) = (2x-y, x)$ is linear. 10

4. (a) Let $T: \mathbb{R}^3 \to \mathbb{R}^2$ be the linear transformation for which $T(1,2,1) = (1,0)$, $T(2,9,0) = (-1,1)$ and $T(3,3,4) = (0,1)$. 12
Find a formula for $T(a,b,c)$ and hence find $T(7,13,7)$.

(b) Let $T: \mathbb{R}^3 \to \mathbb{R}^3$ be the linear mapping defined by $T(x,y,z) = (2x+y, x-y, z)$.
Find the matrix representation of the linear operator T on relative to the basis $\{e_1 = (1,0,0),\ e_2 = (0,1,0) \textit{ and } e_2 = (0,0,1)\}$. 13

SECTION B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Let $A = \begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}$. Find all eigenvalues and bases of each eigenspace. Is A diagonalizable? If so, find an invertible matrix P such that $P^{-1}AP$ is diagonal. 18

(b) State the Caley-Hamilton theorem. Verify this theorem for the matrix in (a). 7

6. The final marks in Mathematics-III of 80 students at UAP are recorded in the accompanying table:

68	84	75	82	68	90	62	88	76	93
73	79	88	73	60	93	71	59	85	75
61	65	75	87	74	62	95	78	63	72
66	78	82	75	94	77	69	74	68	60
96	78	89	61	75	95	60	79	83	71
79	62	67	97	78	85	76	65	71	75
65	80	73	57	88	78	62	76	53	74
86	67	73	81	72	63	76	75	85	77

Construct: 25

(i) a frequency distribution of the diameters using appropriate class interval,
(ii) a histogram,
(iii) a frequency polygon,
(iv) a relative frequency histogram,
(v) an ogive.

7. (a) The following table shows a frequency distribution of the monthly wages in dollars of 65 employees at the P and R company.

Wages($)	Number of Employees
50.00 – 59.99	8
60.00 – 69.99	10
70.00 – 79.99	16
80.00 – 89.99	14
90.00 – 99.99	10
100.00 – 109.99	5
110.00 – 119.99	2
Total	65

Find the mean, median and modal wage of the 65 employees. 15

(b) The contents of urns I, II and III are as follows:
Urn I: 1 W, 2B & 3R balls,
Urn II: 2 W, 1B & 1R balls and
Urn III: 4 W, 5B & 3R balls.
One urn is chosen at random and then 2 balls are drawn from it. They happen to be white and red. What is the probability that they came from urn I, II and III? 10

8. Masses of 100 male student s at UAP is given bellow:

Mass(kilogram)	Number of students
60 – 62	5
63 – 65	18
66 – 68	42
69 – 71	27
72 – 74	8
Total	100

Find the standard deviation of the masses of the above 100 male students at UAP. 7

(a) Calculate the first four raw moments. Convert the result into the moments about the mean. Compute the values $\gamma 1$ and $\gamma 2$ and comment on the result. 10

(b)

(c) Large lots of incoming product of a manufacturing plant are inspected for defect by means of sampling scheme. 10 items are to be examined and the lot is rejected if 2 or more defects are observed. If a lot contains exactly 5% defects, what is the probability that the lot will be rejected? Accepted? 8

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2010
Program : B.Sc Engineering (Civil)

Course Title: Mathematics IV
Time: 3 hrs

Course Code: MTH-203
Full Marks: 150

There are two sections in the question paper namely "***SECTION A***" and "***SECTION B***". You have to answer from both sections according to the instruction mentioned in each section

SECTION A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Find $L\{J_0(t)\}$ where $J_0(t)$ is the Bessel function of order zero. 15

   (b) Use the result of (a) find $L\{J_0(at)\}$. 5

   (c) Evaluate $L\{e^{-t}\cos 2t\}$. 5

2. (a) Prove that (i) $L\{\sin at\}=\frac{a}{s^2+a^2}$ 15

   (ii) $L\{\cosh at\}=\frac{s}{s^2-a^2}$ *if* $s>|a|$

   (b) Show that $L\{\int_0^t \frac{1-e^{-u}}{u}du\}=\frac{1}{s}\ln(1+\frac{1}{s})$ 10

3. (a) If $L^{-1}\{f(s)\}=F(t)$, Prove that 10

   $$L^{-1}\{f^n\{s\}\}=L^{-1}\{\frac{d^n}{ds^n}f(s)\}=(-1)^n t^n F(t), \text{where } n=1, 2, 3\ldots \ldots \ldots$$

   (b) Find $L^{-1}\{\frac{s}{(s+1)^5}\}$ 8

   (c) Find $L^{-1}\{\frac{se^{-2s}}{(s^2+3s+2)}\}$ 7

4. (a) Solve the following initial value problem: 10

   $$Y''(t)+4Y(t)=12t, \quad Y(0)=0, \quad Y'(0)=7$$

   (b) Solve the following initial value problem 15

   $$Y'''(t)-3Y''(t)+3Y'(t)-Y(t)=t^2e^t$$
   $$Y(0)=1, \quad Y'(0)=0, \quad Y''(0)=-2$$

SECTION B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Define Fourier series. Determine the coefficients a_0, a_n and b_n of Fourier series. 15

   (b) Derive the Fourier integral of an odd function. 10

6. (a) The function x^2 is periodic with $2l$ on the interval $[-l, l]$. Find its Fourier series. 15

   (b) Find the Fourier transform of $f(x)$ define by $f(x) = \begin{cases} \frac{1}{2a}, & |x| < a \\ 0, & |x| > a \end{cases}$. 10

7. (a) Solve the following differential equation 10

   $(2xy^2 + y)dx + (2y^3 - x)dy = 0$.

   (b) Consider the following differential equation 15

   $(x - 2y + 1)dx + (4x - 3y - 6)dy = 0$.

   Solve it by making a suitable transformation.

8. Find the general solution of the following differential equations 10+15

   (a) $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 3y = 2e^{4x}$.

   (b) $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 3y = 2e^{x} - 10\sin x$.

The University of Asia Pacific
Department of Interdepartmental Courses
Final Examination Fall-2010
Program: B.Sc Engineering (CSE/CE/ARCH)

Course Title: Physics I | Course Code: PHY-101 | Credit: 3.00
Time: 3.00 Hours | Full Mark: 150

*[N.B- The figures in the margin indicate full marks. There are two sections in the question paper namely "**SECTION A**" and "**SECTION B**". Answer from both sections according to the instruction mentioned in each section.]*

SECTION A
There are **THREE** questions. Answer any **TWO**

1. (a) State and explain Doppler effect. Derive two expressions for the change in frequency of a note when the observer moves towards and moves away from a stationary source. 15

   (b) A motor car sounding a horn at a frequency of 100 hertz moves away from a stationary observer towards a rigid flat wall with a velocity of 36 km/hr. How many beats per second will be heard by the observer? The velocity of sound in air at room temperature = 332 m/s. 10

2. (a) What is called Acoustics? Write down eight requisites for good acoustics in an auditorium. 15

   (b) An ultrasonic beam is used to determine the thickness of a steel plate. It was noticed that the difference in two adjacent harmonic frequencies is 50 kilo hertz. The velocity of sound in steel is 5000 m/s. Calculate the thickness of the steel plate. 10

3. (a) What is called cantilever? Prove that depression $y = \frac{wl^3}{3YI_g}$, where the terms have their usual meanings. 15

   (b) A uniform rod of length 3.5 m is clamped horizontally at one end. A weight of 4.5 kg is attached at the free end. Calculate the depression at the mid point of the rod. The diameter of the rod is 0.04 m. ($Y=10^{10}$ n/m^2) 10

SECTION B
There are **FIVE** questions. Answer any **FOUR**

4. (a) Show that the moment of inertia of a solid sphere is $I = \frac{2}{5}MR^2$, where the symbols have their usual meanings. 15

   (b) A solid sphere of mass 1 kg and radius 0.25 m rolls without slipping with a uniform velocity of 0.1 m/s along a straight line on a horizontal table. Calculate its kinetic energy. 10

[Turn over

5. (a) Show that the moment of inertia of a uniform circular disc is $I = \frac{MR^2}{2}$, where the symbols have their usual meanings. 15

(b) A thin metal ring of diameter 0.6 m and mass 1 kg starts from rest and rolls down an inclined plane. Its linear velocity on reaching the foot of the plane is 5 m/s. Calculate (i) the moment of inertia of the ring and (ii) the kinetic energy of rotation at that instant. 10

6. (a) Show that at Brewster's angle the reflected and refracted rays are at right angles to each other. 10

(b) Derive the necessary conditions under which elliptically and circularly polarized light are formed. 15

7. (a) Show that the fringe width of bright and dark interference fringe in Young's experiment is equal. 15

(b) In Young's double slit experiment the separation of the slit is 1.9 mm and the fringe spacing is 0.31 mm at a distance of 1 metre from the slits. Calculate the wavelength of light. 10

8. (a) Derive the necessary conditions for the formation of Newton's ring by reflected and transmitted light. 15

(b) A plano-convex lens of radius 300 cm is placed on an optically flat glass plate and is illuminated by monochromatic light. The diameter of the 8^{th} dark ring formed by transmitted light is 0.72 cm. Calculate the wavelength of the light used. 10