The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
Program: B. Sc. Engineering (Civil)

Course Title: Principles of Accounting | Credit Hours: 2.0 | Course Code: ACN 301
Time: 2 hours | Full Marks: 50

Answer any 4 (Four) of the following 6 questions

Notes:

a. Answers must be brief and to-the-point.
b. Answer all parts of a particular question consecutively.

Question 1 (2 + 2.5 + 8 = 12.5)

a. How do journal entries add value in accounting process?

b. Does the agreement between debit total and credit total ensure that the accounts are error-free? Why?

c. Frontier Park was started on 1st April 2007 by C. J. Amaro. The following selected events and transactions occurred during April 2007.

April 1	Amaro invested $50,000 cash in the business.
4	Purchased land costing $30,000 for cash.
8	Incurred advertising expense of $1,800 on account.
11	Paid salaries to employees $1,500.
12	Hire park manager at a salary of $4,000 per month, effective 1st May
13	Paid $1,500 cash for a one-year insurance policy.
17	Withdrew $4,600 cash for personal use.
25	Sold 100 coupon books for $25 each. Each book contains 10 coupons that entitle the holder to one admission to the park.

Instruction: Journalize the April transactions.

Question 2 (3 + 3 + 3 + 3.5 = 12.5)

a. Closing entries are unnecessary. Do you agree? Why?

b. Why are adjusting entries made at the end of an accounting period? Justify.

c. How can a merchandizing business be contrasted against a manufacturing entity?

d. A smart company should always use perpetual inventory system for materials control. Do you agree? Why?

Question 3 (3 + 3 + 3 + 3.5 = 12.5)

a. Why are balance sheet and income statement of a company dated differently? Explain.

b. What different financial statements are prepared for a business organization? Briefly explain.

c. Contrast between selling expenses and administrative expenses.

d. Why is cash discount offered to customers? Present two reasons in support of cash discount offer.

80

Question 4 (4 + 8.5 = 12.5)

a. What do a balance sheet and an income statement report?
Make a comparative analysis between a balance sheet and an income statement.

b. The trial balance of **Squire, Inc.** on October 31, 2007, includes the following selected accounts before adjusting entries.

Squire, Inc.
Trial Balance
October 31, 2007

	Debit	Credit
Cash	Tk. 15,200	
M.A. Rahim, Drawings	500	
Advertising Supplies	2,500	
Prepaid insurance	600	
Office equipment	5,000	
Notes payable		5,000
Accounts Payable		2,500
Unearned revenue		1,200
M.A. Rahim, Capital		10,000
Service Revenue		10,000
Salaries Expense	4,000	
Rent Expense	900	
Total	**28, 700**	**28, 700**

An analysis of the accounts shows the following:

1. Supplies on hand total Tk. 1,000.
2. Interest of Tk. 500 on the notes payable has accrued during October.
3. One-half of the unearned revenue was earned in October.
4. At October 31, Squire owed employees Tk. 800 in salaries that will be paid on November 1.
5. Insurance expires at the rate of Tk. 600 per month.

Instruction: Prepare the adjusting entries needed at October 31, 2007.

Question 5 (3 + 3 + 6.5 = 12.5)

a. Why is cash flow statement prepared? Explain.

b. How can accrual basis and cash basis of accounting be contrasted?

c. Tough n Tough, Inc. began operations as a private investigator on January 1, 2007.
The selected trial balance accounts for Tough n Tough, Inc. at March 31 are as follows.

Tough n Tough, Inc.
Trial Balance
For the Quarter Ended March 31, 2007

	Debit	Credit
Sherlock Holmes, Capital		20,000
Sherlock Holmes, Drawings	600	
Service Revenue		13,620
Salaries Expense	2,200	
Travel Expense	1,300	
Rent Expense	1,400	

Instructions: Journalize the closing entries needed at March 31, 2007.

Question 6 (6.5 + 6 = 12.5)

The trial balance of **Sellers Electronix Company** contained the following accounts at December 31, the end of the company's fiscal year.

Sellers Electronix Company
Trial Balance
December 31, 2007

	Debit	Credit
Cash	Tk. 3,00,000	
Accounts Receivable	59,000	
Store Supplies	1,20,000	
Merchandise Inventory	4,16,000	
Land	50,000	
Store Equipment	50,000	
Accumulated Depreciation-Store Eq.		Tk. 8,000
Accounts Payable		50,000
Notes Payable		60,000
Siam Sadman, Capital		8,00,000
Siam Sadman, Drawings	10,000	
Sales		4,80,000
Interest Revenue		3,000
Sales Returns	12,000	
Sales Discounts	8,000	
Cost of Goods Sold	3,00,000	
Store Salaries Expense	25,000	
Advertisement Expense	16,000	
Freight out	7,000	
Utilities Expense	17,000	
Insurance Expense	2,000	
Salaries Expense	9,000	
Total	**14,01,000**	**14,01,000**

Adjustment data:

1. Merchandise inventory actually on hand is Tk. 4,00,000.
2. Depreciation is Tk. 8,000 on store equipment (consider it as a selling expense).
3. Store supplies on hand totaled Tk. 1,00,000.

Other data:

1. Salaries expense, utilities expense, and insurance expense are 100% administrative.
2. Store supplies expense and freight out are considered as selling expense.

Instructions:

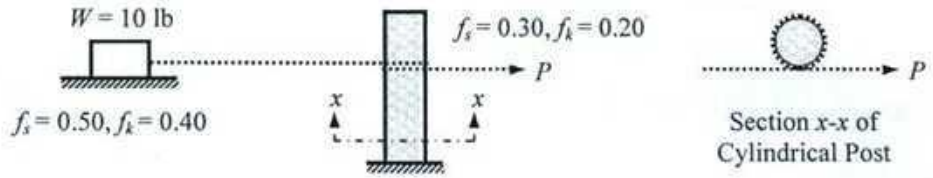
Prepare an income statement for the year and a balance sheet at December 31, 2007.

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008 (Set A1)
Program: B. Sc. Engineering (Civil)

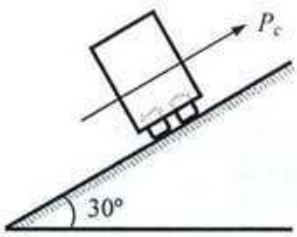
Course Title: Engineering Mechanics II | Credit Hours: 3.0 | Course Code: CE 103
Time: 3 hours | Full Marks: 100 (= 10 × 10)

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

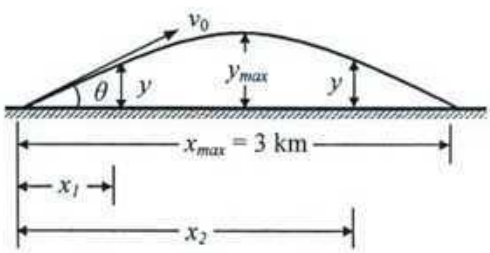
1. The figures below show a force P being applied on a cable wrapped one full turn around a cylindrical post to pull a body (weighing $W = 10$ lb) along a horizontal surface. Calculate force P if the body is
   (i) on impending motion,
   (ii) moving towards right.



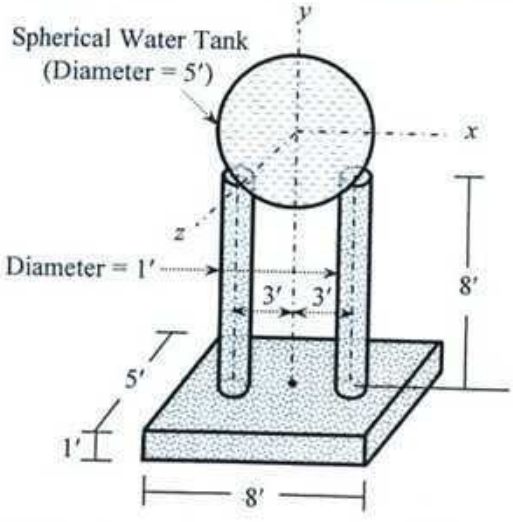
2. The figure below shows a car (weighing 3000 lb) traveling over a curved pavement inclined 30° with the horizontal. If the friction factor between the car wheel and pavement is 0.20, calculate
   (i) the maximum centripetal force P_c the car can resist to be in equilibrium
   (ii) the maximum allowable velocity of the car if the radius of the curved pavement is 100 ft.



3. (i) Calculate the minimum velocity (v_0) and corresponding angle (θ) needed by a projectile to travel a horizontal distance $x_{max} = 3$ km before hitting ground.
   (ii) For the values of v_0 and θ calculated in (i), determine the
   (a) maximum height (y_{max}) reached by the projectile
   (b) horizontal distances (x_1 and x_2) at which the projectile will hit a target at height $y = 30$ m.



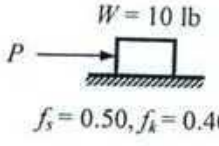
4. For the structure shown in the figure below, calculate the mass moment of inertia (I_y) about the y-axis [Neglect the self-weight of the spherical water tank and assume the tank to be filled with water].

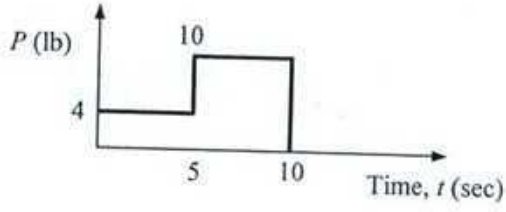


Water (Unit Weight = 62.5 lb/ft^3)

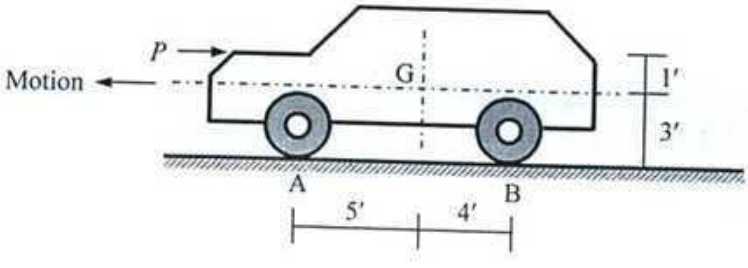
Reinforced Concrete (Unit Weight = 150 lb/ft^3)

5. If a body (weighing $W = 10$ lb) is initially at rest and subjected to a variable force P as shown below, calculate its
   (i) velocity and displacement after 10 seconds,
   (ii) time needed to stop the body.

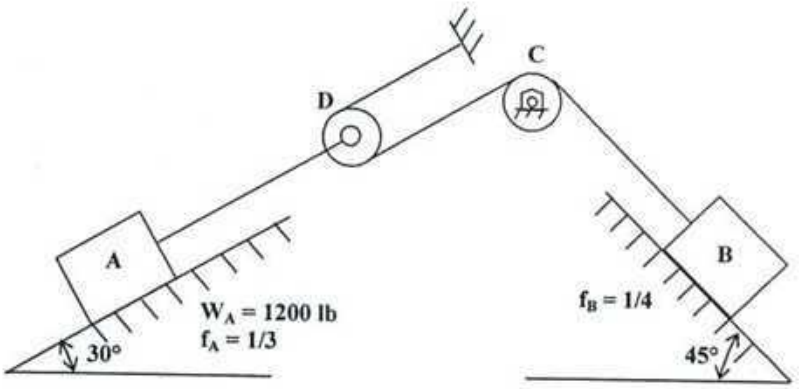




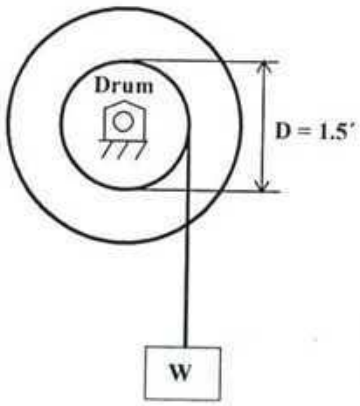
6. In the figure shown below, G is the centroid of a car that weighs 4000 lb and is traveling at a velocity of 30 mph on a rough road ($f_k = 0.50$). Calculate the
   (i) force P needed to stop the car within 10 ft,
   (ii) corresponding reactions at wheel A and B.



7. In the following figure, the pulleys **C** and **D** are frictionless and weightless.
   (i) If block **A** moves 40 ft from rest up the incline in 10 sec, what is the weight of block **B**?
   (ii) What are the forces in the cables attached to the blocks **A** and **B**?
   (iii) What is the change of potential energy for the whole system?

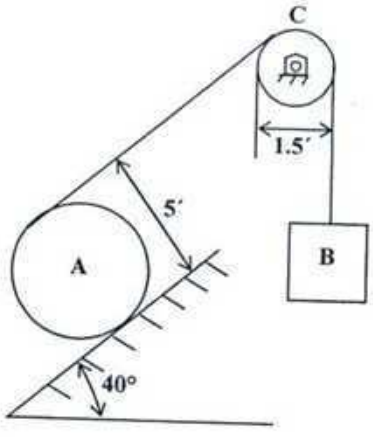


8. In the figure given below, the diameter of the inner drum within a rotating assembly is 1.5′. A weight W = 30 lb is suspended with a cable from the drum. Neglect the friction and mass of the cable. The radius of gyration of the rotating assembly is 2′.

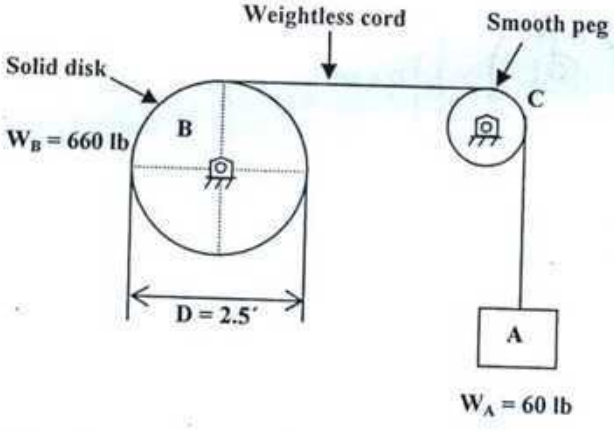


If **W** is released from rest and descends 15 ft in 3 sec, calculate
(i) the weight of the rotating assembly,
(ii) the tension in the cable.

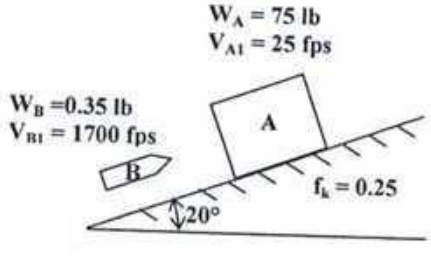
9. A disk **A** (with I_A= 5 slug/ft^2) has a weightless cord wrapped about its mid-section. This cord passes over a frictionless and weightless sheave **C** and thence downward to a 100 lb weight **B**.
   (i) If the system starts from rest, what is the final speed of the c.g of **A** and the acceleration of **B** after **B** moves 15 ft?
   (ii) What is the tension in the cable?



10. Refer to the following figure, neglecting frictional effects, calculate
   (i) the time taken for **A** to attain a speed 35 fps from an initial speed of 20 fps.
   (ii) the tension in the cord.



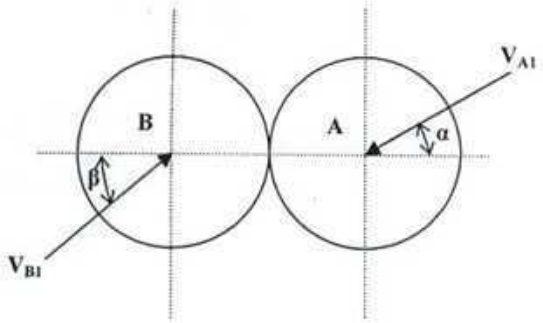
11. A block **A**, as shown in the following figure, is moving up an incline and it is struck by a projectile **B** moving parallel to and upward along the incline. The projectile embeds itself in the block.



Calculate the
(i) time duration for which the block moves after the impact,
(ii) distance traveled by the block after the impact,
(iii) loss of kinetic energy at the impact.

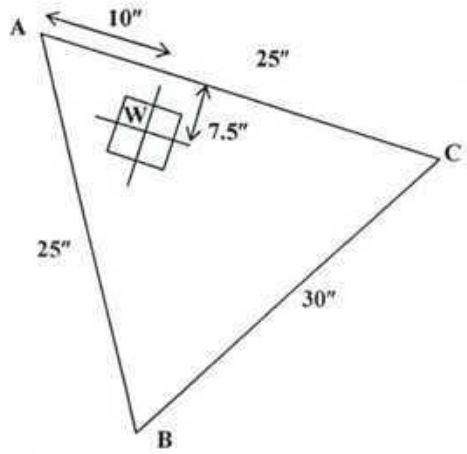
12. Two smooth spheres A and B of equal diameter and on a horizontal plane collide with oblique central impact, as shown in the following figure. Each sphere weighs 8 lb. Coefficient of restitution is 0.75.

What are the absolute velocities (including directions) of each sphere after impact?



V_{A1} =30 fps
V_{B1} = 20 fps
α = 30°
β = 40°

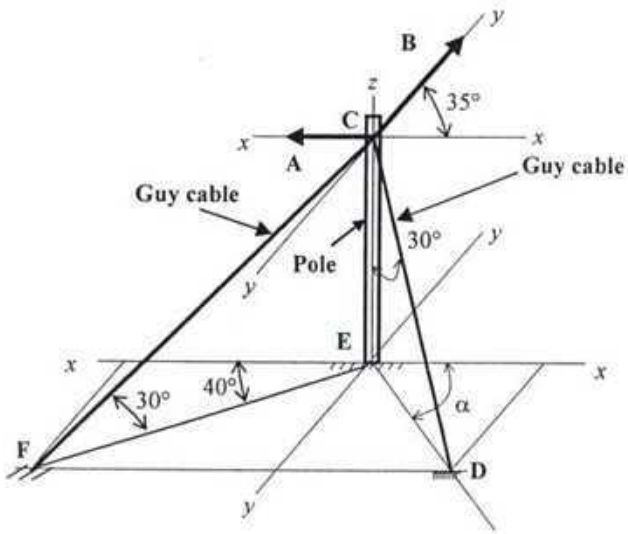
13. As shown in the following figure, the weight W = 50 lb is placed on a triangular table with legs at A, B and C. Find the reactions at supports **A**, **B** and **C**.



14. Two cables **A** and **B** terminate on a pole as shown in the following figure and exert forces in the horizontal *x*-*y* plane at **C**. The guy cable **CD** makes an angle of 30° with the pole and the anchor at **D** is to be so located that the pole will have only a compressive load. Let **A** = 5000 lb, **B** = 8000 lb and **CE** = 25′. Total compressive load acting on the pole is 10000 lb. Calculate

(i) the value of angle α

(ii) the tension in the cable **CD** and **CF**.



The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
Program: B.Sc. Engineering (Civil)

Course # CE 105
Full Marks: 150

Course Title: Surveying
Time : 3 hrs

*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.**

$25 \times 3 = 75$

1. (a) Explain how the procedure of reciprocal levelling eliminates the effects of atmospheric refraction and earth's curvature. (7)

   (b) Write short note on "Field Book". (6)

   (c) A railway embankment 400 m long is 15 m wide at the formation level and has the side slope 3 to 1. The ground levels at every 100 m along the center line are as under: (12)

Distance	0	100	200	300	400
R.L.	205.8	206.2	207.8	207.2	208.3

   The formation level at zero chainage is 207.00 and the embankment has a rising gradient of 1 in 100. The ground is level across the line. Calculate the volume of earthwork.

2. (a) Explain the "closing error" of a compass survey? Show how you can adjust it by graphical method. (7)

   (b) A closed traverse was conducted around an obstacle and the following observations were made. Work out the missing quantities: (12)

Side	Length (ft)	W.C.B
AB	516	87^0
BC	300	$177^0\ 23'$
CD	-	$269^0\ 43'$
DA	220	23^0

   (c) Write short notes on i) Check line ii) Engineer's Chain (3+3)

3. (a) What are the different instruments that are used in chaining? (3)

   (b) Describe the following methods as used in plane table surveying. (7)

   i) Intersection ii) Radiation

(c) The following consecutive readings were taken with a level

6.21, 4.92, 6.12, 8.42, 9.81, 6.63, 7.91, 10.21

The level was shifted after 4th, 6th and 9th readings. The reduced level at first point was 100 ft. Calculate the reduced levels of the points by using height of instrument method and apply usual arithmetical check.

4. (a) What is contour? What are the characteristics of contour?

(b) Explain with neat diagrams the construction and working principle of an optical square.

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

Instrument Near	Staff reading on		Remarks
	P	Q	
P	1.824	2.748	Distance PQ = 1020 m
Q	0.938	1.607	R.L of P = 1267.386 m

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

(d) The length of a line measured with a 20 meter chain was found to be 255 meters. Calculate the true length of the line if the chain was 10 cm too long.

SECTION B

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

$25 \times 3 = 75$

Assume reasonable values for missing data (if any)

5. (a) What is super elevation? Derive the formula for super elevation.

(b) Define & derive equations for Degree of curvature with respect to "Arc Definition" and "Chord Definition."

(c) Two tangents intersect at Chainage 59+60, the deflection angle being $50^0 30'$. calculate the necessary data for setting out a curve of 15 Chains radius to connect the two tangents if it is intended to set out the curve by Rankine's method of tangential angles. If the theodolite has a least count of 20", tabulate the actual readings of deflection angles. Show up to fourth deflection angle.

6. (a) What is remote sensing? What are the objectives of remote sensing?

(b) Describe the procedure of setting out combined curve by Deflection Angles.

(c) What are the requirements of a transition curve?

(d) A transition curve is required for a circular curve having radius of 200m, the gauge being 1.5m and maximum super-elevation restricted to 15cm. Calculate the required length of the curve and design speed if rate of change of radial acceleration is 30 cm/sec^3.

7. (a) Prove that, a shift bisects a transition curve and vice-versa. (5)

(b) What is centrifugal ratio? Name the methods for finding the length of a transition curve. (5)

(c) Draw a simple circular curve showing Back Tangent, Forward tangent, Intersection Angle, Tangent distance, Versed sine of a curve, Long Chord, Point of curve, Point of tangency, External distance and point of Intersection. (10)

(d) Describe the method of setting out a circular curve by ordinates from the long chord. (5)

8. (a) Explain how you measure the elevation of a point by photographic measurement. Derive necessary mathematical equations. (6)

(b) State the different reasons for overlap in Arial photogrammetry. (5)

(c) What are crab and drift? (4)

(d) The scale of an aerial photograph is 1cm=100 m. The photograph is 1cm=100 m. The photograph size is 20cm × 20cm. Determine the number of Photographs required to cover an area of 100 sq km. if the longitudinal lap is 60% and the side lap is 30%. (10)

9. (a) Define: i) Latitude ii) Declination (2)

(b) What is a circumpolar star? State the condition for a circumpolar star. (2)

(c) Define: i) Sensible horizon ii) Nautical mile (5)

(d) What is Parallel of Latitude? Name at least two important Parallel of Latitude. Explain the zone of earth. (8)

(e) Name the different co-ordinate systems and explain the celestial latitude and longitude systems. (8)

Given formula:

1) Level Section $A = (b + nh)\, h$

2) Two-Level Section $A = \{n\,(b/2)^2 + m^2\,(b+nh)h\}/(m^2-n^2)$

3) Three-Level Section $A = \{b\,(h_1+h_2)/4 + h\,(w_1+w_2)/2\}$

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

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

$h_2 = m_2 n/(m_2-n)\,(h-b/2m_2)$

Note: Here the symbols have their usual meanings.

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
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 construction project based on the following data: (40)

Volume ratio of sand to total aggregate = 0.40
Air Content = 3%
Specific gravity of cement = 3.1
Specific gravity of sand (SSD) = 2.6
Specific gravity of coarse aggregate (SSD) = 2.62
Design compressive strength (28 days) = 4000 psi
Minimum required slump = 175 mm
Maximum aggregate size = ¾ inch
Aggregate type = stone chips

Following graphs are provided :

- Compressive strength (28 days) versus W/C.
- Cement content versus compressive strength (28 days) for different aggregate size and slump value

(i) Calculate the unit contents of cement, water, sand, and coarse aggregate
(ii) Calculate the volume ratio of the mix (assume unit weights of cement, sand (SSD), and coarse aggregate (SSD) with void are 1400 kg/m^3, 1350 kg/m^3 and 1600 kg/m^3, respectively).
(iii) Prepare a mixture proportion table with necessary data.
(iv) Estimate the materials in weight and volume (cement, water, sand, and coarse aggregate) required to cast a slab of size 100 ft by 100 ft and thickness of 6 inch.
(v) What adjustments are necessary in mix design if wet sand is used instead of SSD sand during mixing concrete?

2 For a building construction project, the recommended FM of sand is 2.6. From a nearby market, a sand sample was collected and sent to a concrete laboratory for sieve analysis. The sieve analysis data are given below: (22)

ASTM Sieve	Amount Retained (g)
3 inch	0
1.5 inch	0
¾ inch	0
3/8 inch	0
#4	0
#8	70
#12	70
#16	60
#30	50
#40	50
#50	35
#100	40
#200	20
Pan	5

(i) Calculate FM of the sand sample.
(ii) Draw the grading curve of the sand sample.
(iii) Discuss the possible ways to improve the FM of the sand sample to 2.6?
(iv) Make comments on the sand sample based on the sieve analysis data and grading curve.

3 (a) Draw typical stress-strain curves of steel and concrete and explain the key features of the curves. (4)

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

(c) Write the commonly used tests to check the quality of bricks in field. (3)

(d) Explain the strength development process of brick during burning. (3)

(e) What measures are necessary to avoid plastic shrinkage and drying shrinkage cracks of plaster (mortar) applied over the brick walls? (3)

(f) "Concrete is a commonly used construction material everywhere in the world"- Explain the reasons. (4)

4 (a) Define hydration of cement. Write the hydration reactions of cement. Explain the morphology and the significance of each cement hydration products. (10)

(b) "Fly ash has pozzolanic activity but slag has both hydraulic and pozzolanic activity" – Why? (4)

(c) Write short notes on normal consistency, initial setting time, and final setting time of cement. (3)

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

(e) What will happen if gypsum is added with very hot clinker? (2)

5 (a) Explain possible ways of seawater attack of concrete with chemical reactions. (10)

(b) During construction site visits of a residential project, the following points were noted: (10)

(i) Beam 1 - clear cover is 0.5 inch in left face and at the right face the clear cover is 3.5 inch.
(ii) Beam 2 – construction joint is placed at the middle of the beam
(iii) Column 1 – laitance is not removed
(iv) Column 2 – over vibration is applied
(v) Slabs – a lot of bleeding water is found on the surface
(vi) Stair – leakage through the formwork is found after placing concrete
(vii) Concrete – segregation is found with a very high slump
(viii) Sand – a lot of particles over 4.75 mm are found
(ix) Coarse aggregate – small quantities of smaller size aggregates is found
(x) Water – dirty water is used

Make comments on each of the above points keeping in mind durability of concrete and ACI guideline.

(c) What is workability of concrete? How is it measured? (2)

6 (a) Discuss the changes of workability of concrete for the following situations: (5)

(i) W/C is increased at site
(ii) A fine sand is used instead of a coarse sand
(iii) Water reducing admixture is used which was not specified in the mix proportion
(iv) Brick chips are used instead of round-shaped shingles
(v) Wet sand is used instead of SSD sand

(b) Compare fly ash cement and ordinary Portland cement with respect to the followings: (7)

(i) Strength development of concrete at the early age
(ii) Strength development of concrete after long-term
(iii) Environmental benefits
(iv) Heat of hydration of cement
(v) Workability of concrete
(vi) Length of curing time of concrete
(vii) Microstructure of concrete
(viii) Durability of concrete

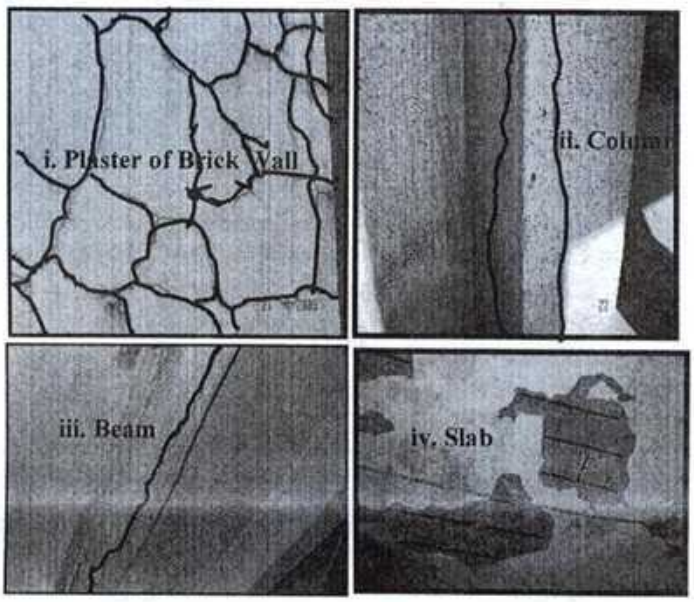
(c) "Cube strength of concrete is higher than the cylinder strength of concrete" – Why? (3)

(d) Write short notes on the followings: (7)

(i) High performance concrete
(ii) Ferrocement
(iii) Autogeneous shrinkage
(iv) Cold joint
(v) Construction joint
(vi) Superplasticizer
(vii) Carbonation of concrete

7 (a) Construction of a civil engineering project is scheduled in summer (maximum temperature in the day = 35°C and humidity is below 70%). Explain the key measures which are to be considered to avoid early cracking in concrete. (3)

(b) Explain the possible reasons of deterioration of the following structural elements: (4)



(c) "High early strength of concrete can be obtained by using a very fine cement" – Why? (2)

(d) Explain the change in volume of sand with the variation of moisture content. (3)

(e) Explain the following defects of timber: (3)

(i) Knots
(ii) Shakes
(iii) Rind galls

(f) Write the purposes of seasoning timber. (3)

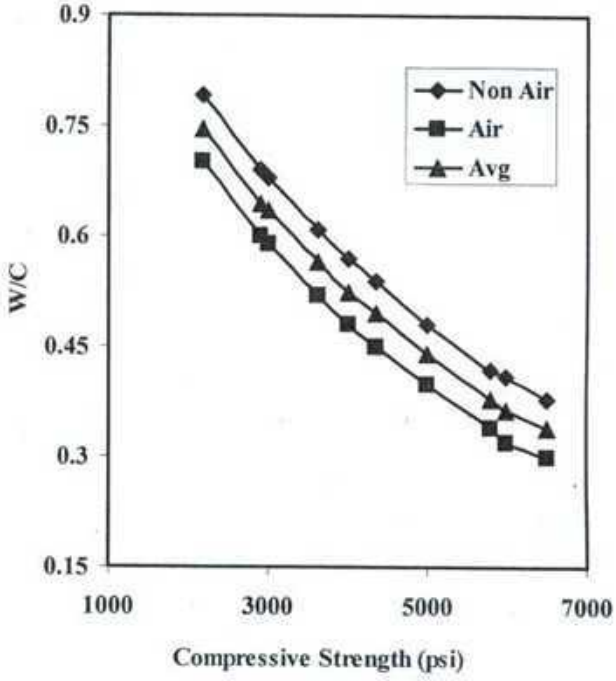
(g) Discuss the formation process of annual rings of exogenous trees. (4)

8 (a) Explain the formation of corrosion cells over the steel bars in concrete with chemical reactions, location of anodic and cathodic areas, and the movement of hydroxyl ions and electrons. (3)

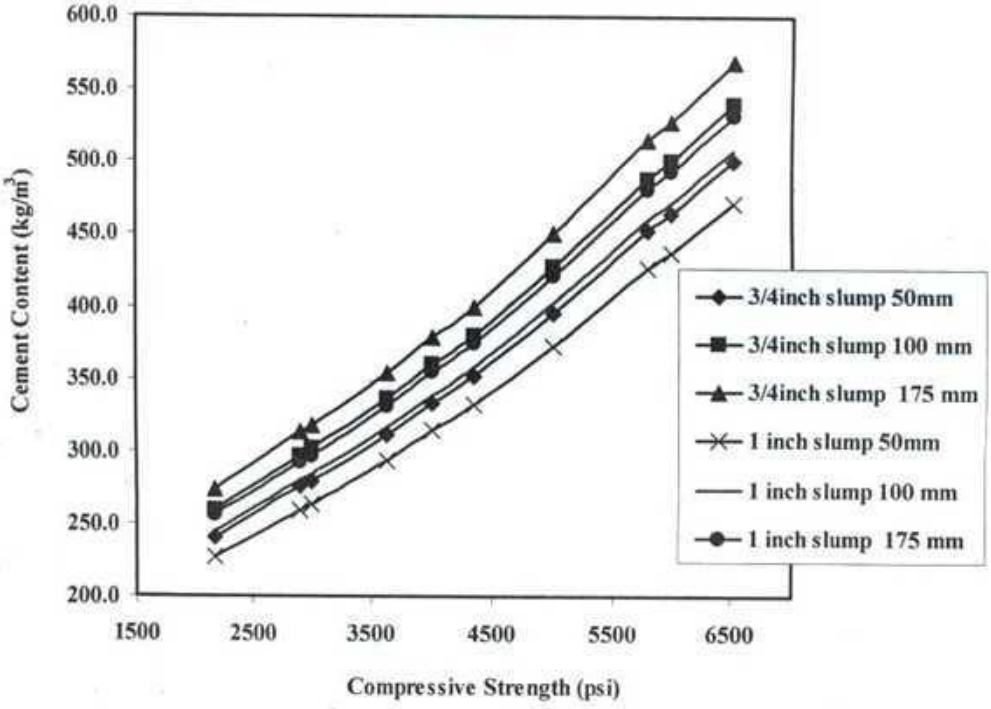
(b) How are steel bars protected from corrosion in concrete? Discuss the reasons of initiation of corrosion of steel bars in concrete. Write the points which are to be considered to avoid early corrosion over the steel bars in concrete. (5)

(c) Write short notes on the followings: (14)

(i) Thermoplastics and thermosetting plastics
(ii) Uses of rubber in civil engineering works
(iii) Ingredients of a paint
(iv) Electroplating
(v) Atomic packing factor of face centered cubic unit cell
(vi) Crystal and amorphous structures
(vii) Metallic bond



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



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

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
Program: B. Sc. Engineering (Civil)

Course # : CE-203 | Course Title: Engineering Geology & Geomorphology
Full Marks: 120 (6 X 20 = 120) | Time: 3 hours

Section A

There are **four (4)** questions in this section, answer **any three (3)**

1. (a) Draw a schematic diagram of the rock cycle and discuss (with at least two examples of each) about igneous, sedimentary and metamorphic rocks according to the cycle. **14**
   (b) Describe, in brief, the principal zones of the earth in geologic point of view. **6**

2. (a) Define mineral. Name the common physical properties of minerals. Classify (no description is required) major minerals. Distinguish between Ferromagnesian and Non-Ferromagnesian Silicates. **8**
   (b) Classify fold (mention names only) based on geometry. **3**
   (c) Classify and discuss briefly (with neat sketches) various types of faults according to the direction of movement and net slip. **9**

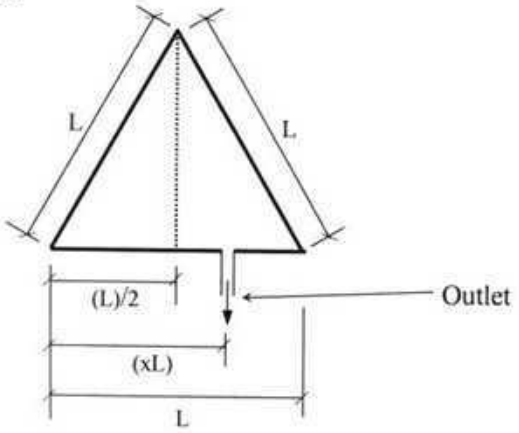
3. (a) Define earthquake. Mention the causes of earthquake. Define the major earthquake parameters (geometric) with neat sketches. **8**
   (b) Discuss liquefaction phenomenon (with basic mechanism) due to earthqueke. **7**
   (c) Classify and discuss, in short (no sketch is required), various earthquake waves. **5**

4. Briefly discuss, mention or draw sketches, as asked for, on **any four** of the following topics:- **5 X 4 = 20**
   (i) Different geomorphic processes (no description required) based on origin
   (ii) Neat sketches of horst, dome and syncline
   (iii) Modified Mercalli intensity scale of earthquakes (VIII to XII)
   (iv) Typical geometry of a fold (with neat sketch)
   (v) Distinction between silicate and non-silicate minerals

Section B

There are **four (4)** questions in this section, answer **any three (3)**

1. (a) Define infiltration and percolation. With a simple sketch show the various components of total flow. **3**
   (b) For the following basin, x is a constant factor. For what value of x, the flow rate (Q) will be the maximum for the basin? Find the FF and CC of the basin for maximum runoff. **6**

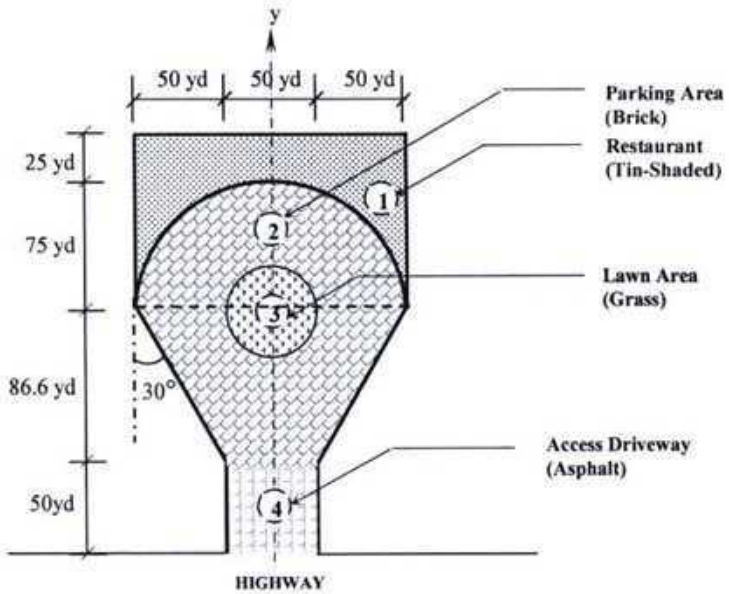


(c) Mention (names only) the factors affecting runoff. 2

(d) Calculate the peak runoff (Q_P) for the following highway restaurant complex as shown below. Use the following data/information as necessary. 9

- Rainfall Intensity for the whole area = 0.75 in/hr
- The area is symmetric about y direction.

Area Type	Co-efficient of Runoff
Brick	0.70
Asphalt	0.75
Grass	0.25

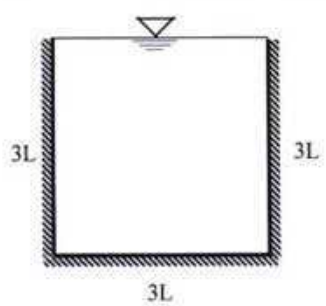


2. (a) What are the major causes of river erosion? 1.5

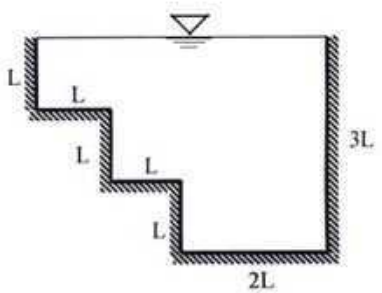
(b) Prove that $d \alpha v^2$; where symbols carry their usual meanings. 6

(c) Prove that $\tau = \gamma_w R_H S$; where symbols carry their usual meanings. 6

(d) The cross-sectional profiles at two locations (location-1 and location-2) of a river are shown in the figures below. The gradient (s) and x-sectional area (A) of these two locations are same. Mention (if all other factors affecting erosion remain constant) which location will exhibit more erosion? Justify your answer. 6.5



Location - 1

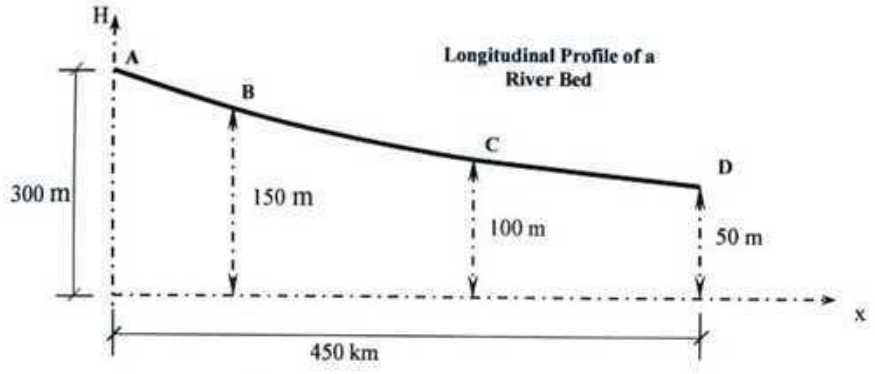


Location - 2

3. (a) Define river transportation, load, capacity and competence. 2

(b) Prove that $H = ae^{-bx}$; where symbols carry their usual meanings. 4.5

(c) From the figure shown in the next page, calculate the horizontal distance between locations B and C along the longitudinal profile of a river. 6.5



c) The number and stream ranks of a catchment area of 700 square miles are calculated and the results of the survey are summarized in the table below. 7

Steam Rank	No. of Streams	Total Length (mile)
1	23	25.3
2	10	24
3	3	19.2
4	1	18.3

Calculate the following parameters from the above survey data:
(i) Average Bifurcation Ratio (ABR)
(ii) Average Length Ratio (ALR)
(iii) Drainage Density (DD)
(iv) Stream Frequency (SF)

4. (a) Classify (mention names only) drainage pattern. Sketch any four types of drainage pattern. 2+4 = 6

(b) What is a river valley? Sketch a typical cross-section of a river/stream valley. Classify (mention names only) valley according to the stage, genesis and controlling structures. Discuss, in brief, different types of valleys based on stage. 1+2+3 = 6

(c) Discuss, in brief, the ways valleys are widened. 8

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
Program: B.Sc. Engineering (Civil)

Course Title: Numerical Analysis & Computer Programming | Course Code: CE 205 | Credit:3.00

Time: 3 Hours | Full Marks: 150

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

1. (a) Use Modified Euler method to evaluate the numerical solution of the following ordinary differential equation: **(15)**

$y' = dy / dx = (1/4) * (1-x^3) * y^2$, for $x = 0.1$ and 0.4.

Here, $y = 2$ at $x = 0$.

Desired accuracy, $\varepsilon = 0.001$.

(b) Evaluate the following definite integral using Gaussian Quadrature. **(10)**

$$I = \int_1^3 (x^2 + 2x)\sin x\,dx \quad \text{(for n = 2)}$$

2. (a) Use the Gauss Jordan method to solve the following system of equations: **(15)**

$6p + q - 4r = 5$

$5p - 3q + 7r = 11$

$9p - 5q + 2r = 6$

(b) Find the inverse square root of 30, using Newton's Iterative formula. **(10)**
Desired accuracy, $\varepsilon = 0.0001$.

3. (a) Using Bisection method, find an approximate root of the following equation: **(10)**

$3x - x^2 \sin x + 7.5 = 0$

Start the trial with $x = -2.8$ and -3.0. Show three trials.

(b) For the following data, **(15)**

Time (sec)	0	20	40	60
Speed (mps)	0.0000	0.4275	1.3442	2.0265

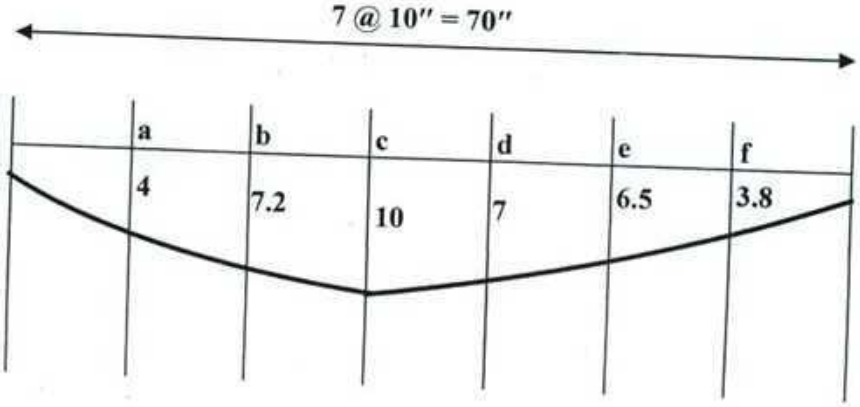
(i) Find the Gregory Newton Interpolation polynomial for Speed vs Time.
(ii) Find the speeds at $t = 25$ sec and $t = 57$ sec.

4. Fit a second order polynomial to the following data.

x	1.5	3.5	5.5	7.5	9.5
y	30	45	50	65	70

Find the value of y corresponding to x = 6, from the fitted curve.

5. Experimentally observed values of the deflections at different points on a beam are shown in the following figure.



All deflections of the above figure are in ($\times 10^{-3}$) inch.
Calculate :

(i) The bending moments at points **a** and **d**.
(ii) The shear forces at points **f** and **c**.
(iii) The slopes at points **b** and **e**.

Given, E = 30,000 ksi, I = 1200 in^4. At any section of the beam, Bending Moment is given by the equation, $M = -EI\,D^2y$; Shear Force, $S = -EI\,D^3y$ and Slope, $\theta = Dy$.

6. **(a)** Basic salaries of five employees of an organization are as follows:

Name of employee	Basic Salary (Tk)
P	10000
Q	15000
R	22000
S	20000
T	25000

House Rent = 35% of Basic Salary
Medical Allowance =15% of Basic Salary
Gross Salary = Basic Salary + House Rent + Medical Allowance

To prepare the salary statement for the employees, a C++ program has been given below:

```
#include<iostream.h>
void main( )
{
        double BasicSalary[5], HouseRent[5], MedicalAllowance[5], GrossSalary[5];

        for(int i=0;i<5;i++)
        {
                cin>>BasicSalary[i];
        }
        cout<<"Basic Salaries of five employees are:"<<endl;
        for(i=0;i<5;i++)
        {
                cout<<BasicSalary[i]<<endl;
        }

        for(i=0;i<5;i++)
        {
                HouseRent[i]=0.35*BasicSalary[i];
        }
        cout<<"House Rents given to five employees are:"<<endl;
        for(i=0;i<5;i++)
        {
                cout<<HouseRent[i]<<endl;
        }

        for(i=0;i<5;i++)
        {
                MedicalAllowance[i]=0.15*BasicSalary[i];
        }
        cout<<"Medical Allowances for five employees are:"<<endl;
        for(i=0;i<5;i++)
        {
                cout<< MedicalAllowance[i]<<endl;
        }

        for(i=0;i<5;i++)
        {
                GrossSalary[i]=BasicSalary[i]+HouseRent[i]+MedicalAllowance[i];
        }
        cout<<"Gross Salaries of five employees are:"<<endl;
        for(i=0;i<5;i++)
        {
                cout<< GrossSalary[i]<<endl;
        }
}
```

Write down the output of the above program.

6. **(b)** Based on the Gross Salary calculated in Question 6(a), write a C++ program to classify the employees as follows: (15

Gross Salary (Tk)	Class of the employee
10000 – 20000	C
21000 – 30000	B
31000 – 40000	A

Take the Gross Salary as an input. Use **for** statement for iteration process and **if** statement for conditions.

7. **(a)** Write a C++ program to calculate the average of three integers. Take the values of the integers as inputs. (1

(b) There are three integers x, y and z. Write a C++ program to find out the largest one among these three integers. Take the integers as inputs. (15

8. **(a)** Three matrices are given as follows: (15

$$\mathbf{A}=\begin{bmatrix}9 & 4 & 1\\ 5 & 1 & 3\\ 6 & 8 & 3\end{bmatrix} \qquad \mathbf{B}=\begin{bmatrix}2 & 3 & 7\\ 8 & 1 & 9\\ 4 & 5 & 7\end{bmatrix} \qquad \mathbf{C}=\begin{bmatrix}5 & 9 & 7\\ 2 & 4 & 5\\ 8 & 6 & 1\end{bmatrix}$$

Write a C++ program to find $[(\mathbf{A}+\mathbf{B})-\mathbf{C}]$

(b) To calculate the sum of the series $1^2+4^2+7^2+10^2+13^2+$ .....n^2 terms, write a C++ program using **if** statement (1

Formulae:

1. $\mathbf{P(u) = f(x_1) + \{\Delta f(x_1)*u\}/1! + \{\Delta^2 f(x_1)*u*(u-1)\}/2! + \{\Delta^3 f(x_1)*u*(u-1)*(u-2)\}/3! + ...}$

2. $\mathbf{\Delta^n f(x_1) = {}^nc_0\, f(x_1 + n*h) - {}^nc_1\, f\{x_1 + (n-1)*h\} + {}^nc_2\, f\{x_1 + (n-2)*h\} - ..... + {}^nc_n\, f(x_1)}$

ANNEXURE

Table: Weighing coefficients w_n and associated points x_n for the Gaussian Quadrature Formula

n	w_n	x_n
2	8/9	0
	5/9	± 0.7746
3	0.6521	± 0.34
	0.3479	± 0.8611
4	0.5689	0
	0.4786	± 0.5385
	0.2369	± 0.9062
5	0.4679	± 0.2386
	0.3608	± 0.6612
	0.1713	± 0.9325

Mathematical Models for Difference Formula

A. *Backward Difference* (∇)

	y_n	y_{n-1}	y_{n-2}	y_{n-3}	y_{n-4}
hD	1	-1			
h^2D^2	1	-2	1		
h^3D^3	1	-3	3	-1	
h^4D^4	1	-4	6	-4	1

B. *Forward Difference* (△)

	y_n	y_{n+1}	y_{n+2}	y_{n+3}	y_{n+4}
hD	-1	1			
h^2D^2	1	-2	1		
h^3D^3	-1	3	-3	1	
h^4D^4	1	-4	6	-4	1

C. *Central Difference* (δ)

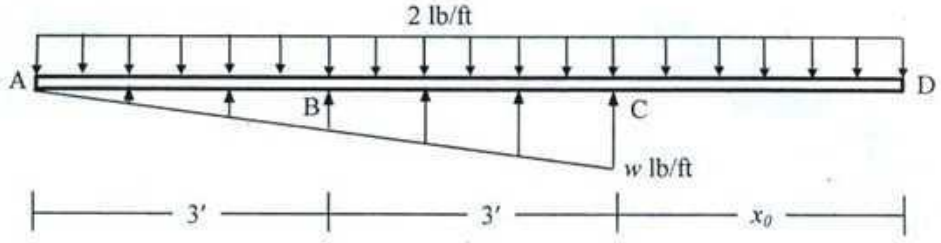
	y_{n-2}	y_{n-1}	y_n	y_{n+1}	y_{n+2}
2hD		-1	0	1	
h^2D^2		1	-2	1	
$2h^3D^3$	-1	2	0	-2	1
h^4D^4	1	-4	6	-4	1

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008 (Set B)
Program: B. Sc. Engineering (Civil)

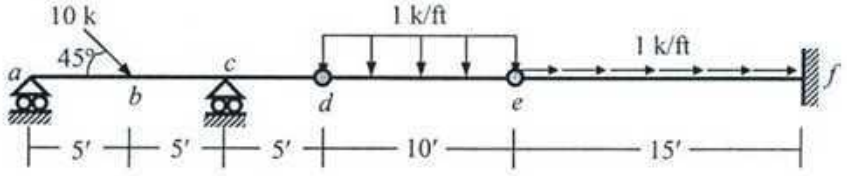
Course Title: Mechanics of Solids I | Credit Hours: 3.0 | Course Code: CE 211
Time: 3 hours | Full Marks: 100 (= 10 × 10)

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

1. For the beam ABCD loaded as shown in the figure below, calculate the
   (i) length x_0 and distributed load w lb/ft required to maintain equilibrium,
   (ii) shear force and bending moment at B using Singularity Functions.

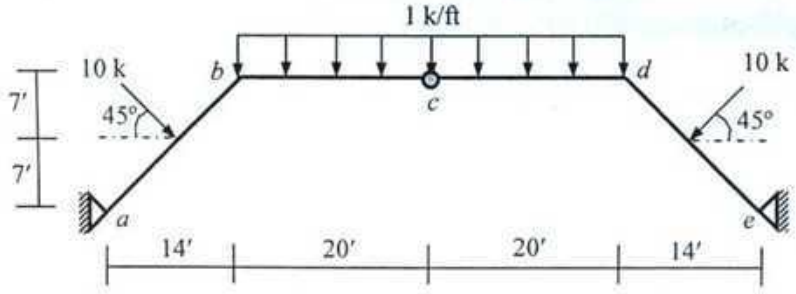


2. Draw the AFD, SFD and BMD of the beam *abcdef* loaded as shown below.



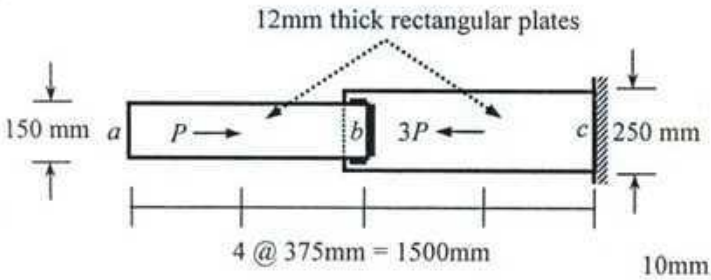
d and *e* are Internal Hinges

3. Draw the AFD, SFD and BMD of the beam *bcd* in the frame *abcde* loaded as shown below.

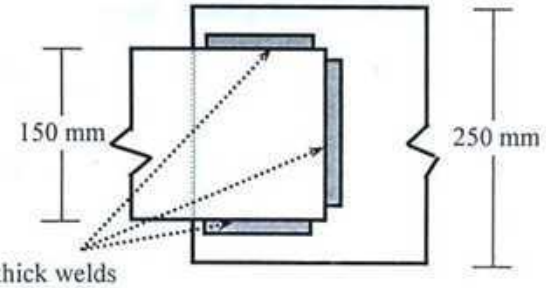


c is an Internal Hinge

4. (i) Calculate the maximum allowable value of P for the axially loaded member *abc* shown below.
   (ii) For the force P calculated in (i), determine the lengths of 10 mm welds to connect the members *ab* and *bc* at joint *b*
   [Given: Allowable stress in shear = 125 MPa, tension = 140 MPa, compression = 110 MPa].

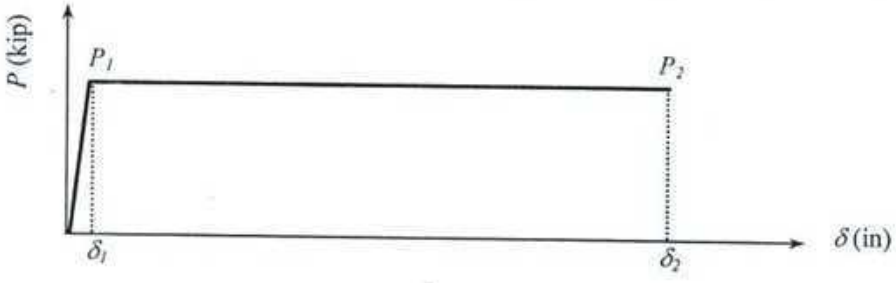


Member *abc*

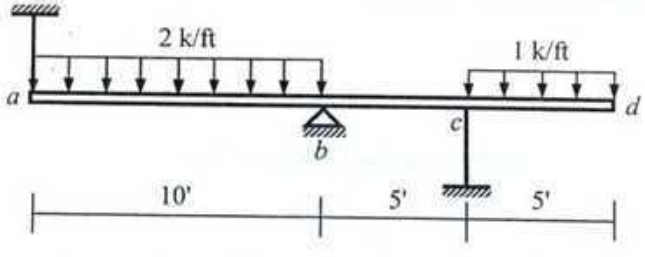


Joint *b*

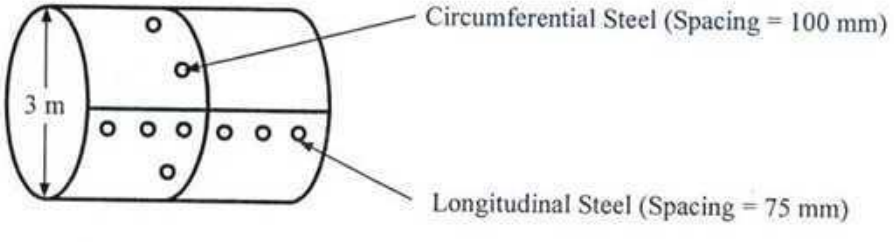
5. The figure below shows the force (P) vs. elongation (δ) diagram of a metal specimen of 2″-length ar 0.5″-diameter. If $P_1 = P_2 = 15$ kips, $\delta_1 = 0.005''$, $\delta_2 = 0.50''$, Poisson's ratio = 0.25, calculate its
(i) Modulus of Elasticity, (ii) Actual Proportional Limit (using Poisson's ratio for lateral strain), (iii) Modulus of Toughness, (iv) Actual Breaking Strength (assuming constant volume of specimen)



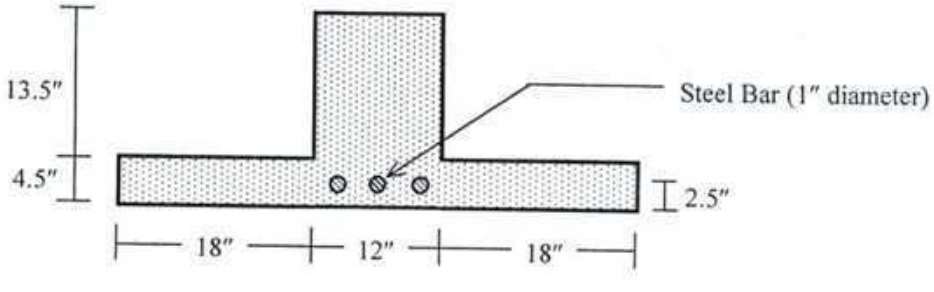
6. Calculate the forces and axial stresses in wires a and b supporting the rigid beam $abcd$ shown below. Also calculate the deflection of the beam at a, c and d
[Given: $E = 30\times10^3$ ksi, $A = 0.30$ in^2, $L = 30''$ for wire a, $E = 20\times10^3$ ksi, $A = 0.15$ in^2, $L = 30''$ for c]



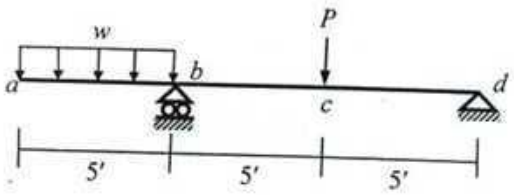
7. The figure below shows a gas cylinder of 3-m diameter subjected to an internal pressure of 500 kPa Calculate the
(i) required wall thickness of the cylinder
(ii) corresponding tangential and longitudinal stresses and strains in the wall
(iii) required diameter of longitudinal and circumferential bolts to resist the wall stresses
[Given: Allowable tensile stress in the wall = 140 MPa, Allowable shear stress in bolts = 110 MPa, Modulus of elasticity of steel = 200 GPa, Poisson's ratio = 0.25].

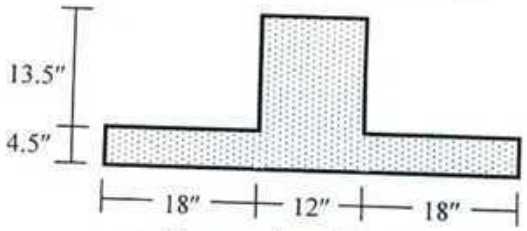


8. For the Reinforced Concrete section shown below
(i) calculate the maximum allowable bending moment if $n = 9$, allowable compressive stress in concrete = 1.5 ksi and allowable tensile stress in steel = 18 ksi [assume the section is 'cracked']
(ii) draw the bending stress diagram over the section for the bending moment calculated in (i).



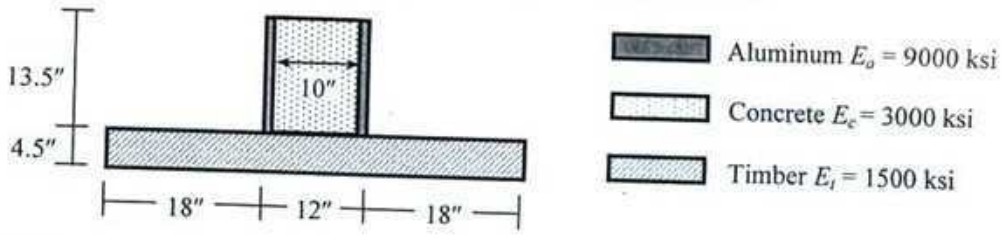
9. For the beam *abcd* loaded as shown below, $P = 0$ and the allowable tensile and compressive bending stresses in the cross-section are 2.0 ksi and 1.5 ksi respectively.
   (i) Calculate the maximum allowable value of the distributed load w.
   (ii) Draw the bending stress diagram over the cross-section for the value of w calculated in (i).





Cross-section of the beam

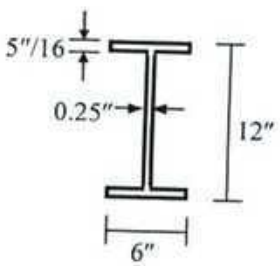
10. For the beam shown in Question 9, draw the flexural strain diagram over the composite cross-sectional area (shown below) at section c, if $P = 10$ kips, $w = 0$.
    Also calculate the maximum flexural stresses in aluminum, concrete and timber.



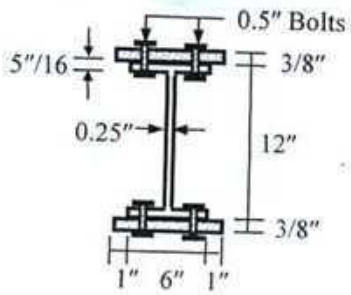
11. Calculate the plastic moment (M_p) and plastic section modulus (Z) of the section shown in Question 9 [Given: Yield Strength $\sigma_{yp} = 3$ ksi].

12. For the beam *abcd* shown in Question 9, $P = 0$ and the allowable flexural shear stress is 100 psi.
    (i) Calculate the maximum allowable value of the distributed load w.
    (ii) Draw the shear stress diagram over the cross-section for the value of w calculated in (i).

13. The figures below show two 3/8" thick rectangular plates are connected to Section1 by 0.5" bolts to form Section2. Calculate the (i) allowable shear forces in Section1 and Section2, (ii) required spacing of 0.5" bolts to resist the allowable shear force in Section2 [Given: allowable shear stress = 15 ksi].

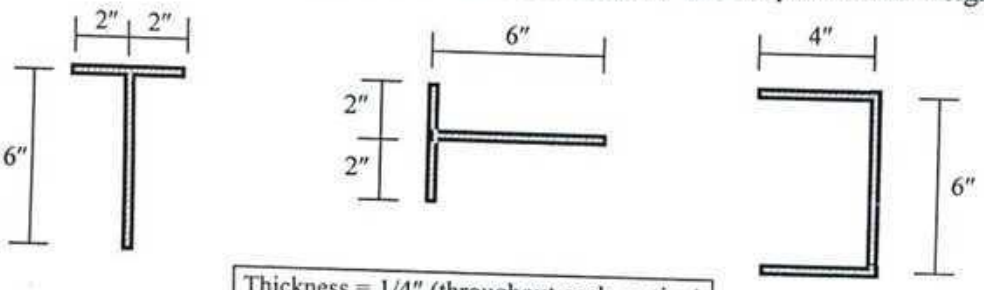


Section1



Section2

14. Cross-sectional areas of three beams are shown below by their centerline dimensions. Calculate the torsional moments caused on the sections by their respective self-weights (100 lb each).



Thickness = 1/4" (throughout each section)

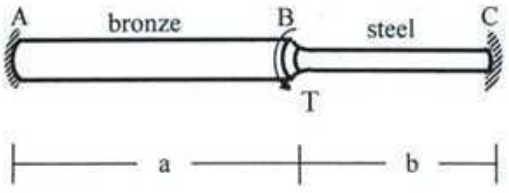
The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
Program: B. Sc Engineering (Civil)

Course Title: Mechanics of Solids II Course Code: CE 213 Credit: 3.00
Time : 3.00 Hours Full Marks:100 (= 10 × 10)

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

1. The compound shaft shown below is attached to rigid supports. Allowable shear stresses of bronze segment and steel segment are 8.7 ksi and 11.6 ksi respectively. Determine the ratio of lengths, b/a so that each material will be stressed to its permissible limit simultaneously. What torque T is required?

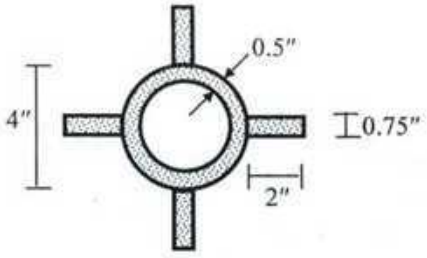
   Given: G_{bronze}= 5000 ksi and G_{steel}= 12000 ksi



Cross-section of member AB

Cross-section of member BC

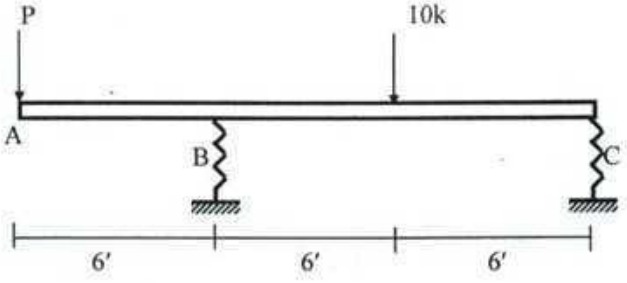
2. A shaft acting as a torsional member is made by welding to a circular pipe four rectangular bars as shown below. If the maximum shearing stress (neglecting the stress concentration) is 8 ksi, what torque T can be applied?



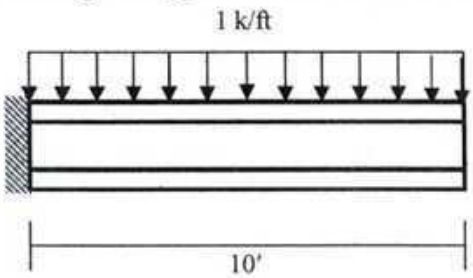
3. The figure below shows a rigid weightless beam ABC as shown being supported by helical spring B and C. If spring C deflects 1″(downward) due to the applied loads , calculate the values of

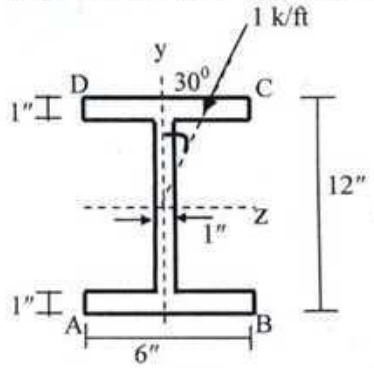
   i) P ii) deflection of spring B iii) maximum shear stress at spring B

   [Given: Both springs have coil diameter=1″, average spring diameter=5″, number of coils=8 and shear modulus=12000 ksi].



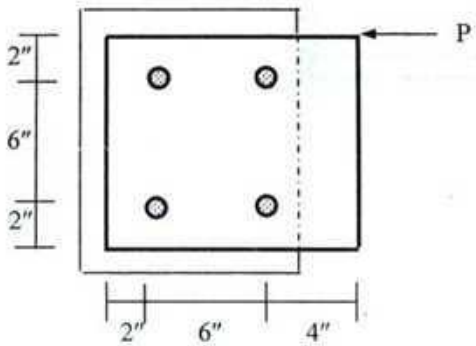
4. Calculate the compound normal stress at points A, B, C and D in the beam shown below (subjecte inclined loading) at support and show the line of N.A.



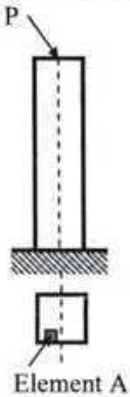


Bean Section

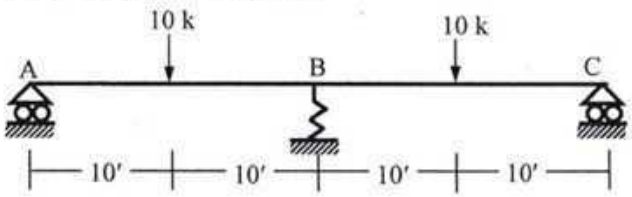
5. For the bolted connection in the figure below, determine the allowable load P if the allowable shear stres the 0.75 " bolts is 12 ksi.



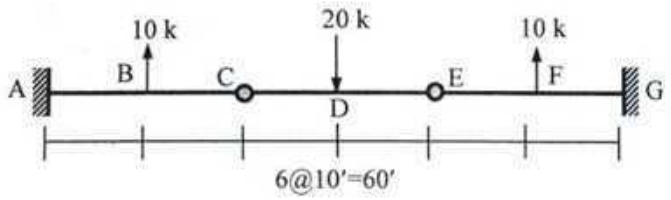
6. The loading applied to the column shown in the figure below causes the following stresses on the elemen
   i. Shearing stress due to shear force =1200 psi
   ii. Normal stress due to axial force = 2000 psi
   iii. Normal stress due to bending moment =1500 psi
   (a) Indicate the resultant stresses on a sketch of the isolated element A.
   (b) Using Mohr's circle, transform the stress into (i) principal stress and (ii) maximum shearing str and associated normal stresses. For both cases show results on properly oriented elements.



7. The beam shown below is simply supported at the left and right ends and spring supported at the center. Use the Singularity Functions to calculate the deflection at B so that bending moment at B is zero Also calculate the spring constant [Given: EI = constant].

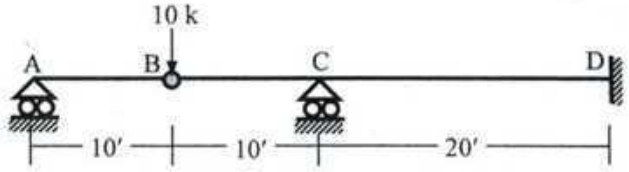


8. For the beam shown below, use the Moment Area Theorems to calculate the deflection at D and rotation at the left of C [Given: $EI = 40\times10^3$ k-ft^2].



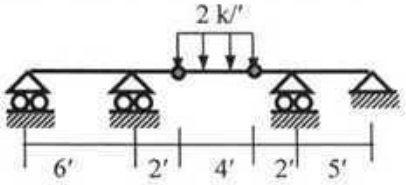
9. Answer Question 8 using the Conjugate Beam Method.

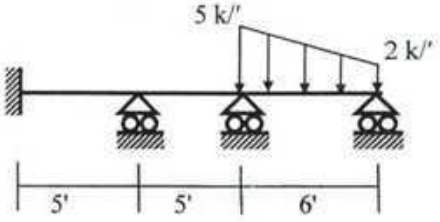
10. Draw the shear force and bending moment diagram of the statically indeterminate beam shown below [Given: EI = constant].



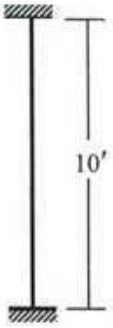
B is an Internal Hinge

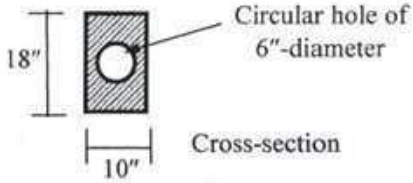
11. For the beams shown below
    (i) Write down the expressions for loading function w(x) using singularity functions.
    (ii) Write down the corresponding boundary conditions.
    (iii) Determine whether the beams are statically determinate or indeterminate.
    (iv) Draw the qualitative deflected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



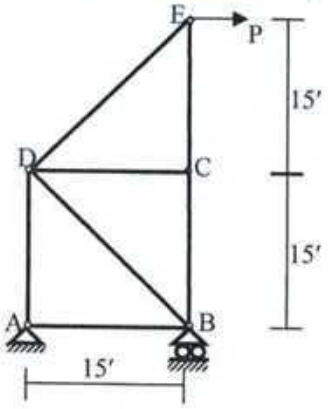


12. A 10-ft long fixed-ended column has a symmetric cross-sectional area as shown below and is made of a nonlinear material with stress-strain relationship given by $\sigma = 40\varepsilon - 10\varepsilon^2$, where σ is the stress (ksi) and ε is the strain. Calculate the critical load for the column.

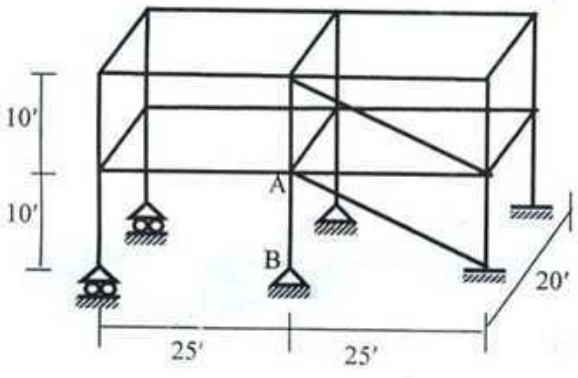




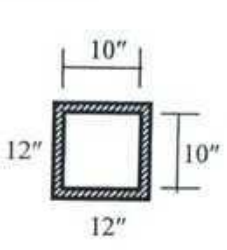
13. Calculate the allowable value of P for the truss shown below using the AISC-ASD criteria [Given: Area A = 2 in^2, r_{min} = 1.5", Modulus of Elasticity E = 29000 ksi, yield strength = 36 ksi, for all members].



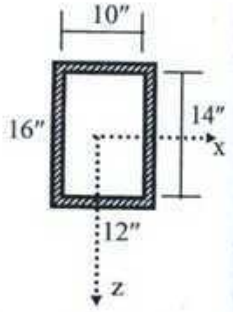
14. In the frame shown below, calculate the effective length factor of column AB about x and z-axis and determine the minimum allowable compressive force on the column according to AISC-ASD criteria [Given: E = 30×10^3 ksi, f_y = 40 ksi, member sections are shown below].



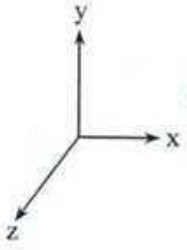
3D Frame



Beam Section



Column Section



List of Useful Formulae for CE 213

* Torsional Rotation $\phi_B - \phi_A = \int (T/J_{eq}G)\, dx$, and $= (TL/J_{eq}G)$, if T, J_{eq} and G are constants

Section	Torsional Shear Stress	J_{eq}
Circular	$\tau = Tc/J$	$\pi d^4/32$
Thin-walled	$\tau = T/(2\text{Ⓐ}\, t)$	$4\text{Ⓐ}^2/(\int ds/t)$
Rectangular	$\tau = T/(\alpha bt^2)$	βbt^3

b/t	1.0	1.5	2.0	3.0	6.0	10.0	∞
α	0.208	0.231	0.246	0.267	0.299	0.312	0.333
β	0.141	0.196	0.229	0.263	0.299	0.312	0.333

* Biaxial Bending Stress: $\sigma_x(z, y) = M_z\, y/I_z + M_y\, z/I_y$
* Combined Axial Stress and Biaxial Bending Stress: $\sigma_z(x,y) = -P/A - M_x\, y/I_x - M_y\, x/I_y$
* Corner points of the kern of a Rectangular Area are (b/6, 0), (0, h/6), (–b/6, 0), (0, –h/6)
* Maximum shear stress on a Helical spring: $\tau_{max} = \tau_{direct} + \tau_{torsion} = P/A + Tr/J = P/A\,(1 + 2R/r)$
* Stiffness of a Helical spring is $k = Gd^4/(64R^3N)$

* $\sigma_{xx}' = (\sigma_{xx} + \sigma_{yy})/2 + \{(\sigma_{xx} - \sigma_{yy})/2\} \cos 2\theta + (\tau_{xy}) \sin 2\theta = (\sigma_{xx} + \sigma_{yy})/2 + \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]} \cos(2\theta - \alpha)$
  $\tau_{xy}' = -\{(\sigma_{xx} - \sigma_{yy})/2\} \sin 2\theta + (\tau_{xy}) \cos 2\theta = \tau_{xy}' = -\sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]} \sin(2\theta - \alpha)$
  where $\tan \alpha \triangleq 2\, \tau_{xy}/(\sigma_{xx} - \sigma_{yy})$
* $\sigma_{xx(max)} = (\sigma_{xx} + \sigma_{yy})/2 + \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2, \alpha/2 + 180°$
  $\sigma_{xx(min)} = (\sigma_{xx} + \sigma_{yy})/2 - \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 \pm 90°$
* $\tau_{xy(max)} = \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$; when $\theta = \alpha/2 - 45°, \alpha/2 + 135°$
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* Mohr's Circle: Center $(a, 0) = [(\sigma_{xx} + \sigma_{yy})/2, 0]$ and radius $R = \sqrt{[\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2]}$

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  $S(x) = \int M(x)\, dx \cong EI\, dv/dx \cong EI\, \theta(x)$, $D(x) = \int S(x)\, dx \cong EI\, v(x)$
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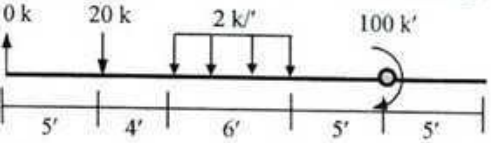

$$w(x) = 10\langle x-0\rangle^{-1} - 20\langle x-5\rangle^{-1} - 2\langle x-9\rangle^{0} + 2\langle x-15\rangle^{0} + 100\langle x-20\rangle^{-2} + C_0\langle x-20\rangle^{-3}$$

First Moment-Area Theorem: $\theta_B - \theta_A = \int (M/EI)\, dx$
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In general, k is obtained from ψ_A and ψ_B for braced and unbraced frames
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Moment magnification factor for a Simply Supported Beam
for concentrated load at midspan of = $[\tan(\lambda L/2)/(\lambda L/2)]$, subjected to end moments only = $[\sec(\lambda L/2)]$
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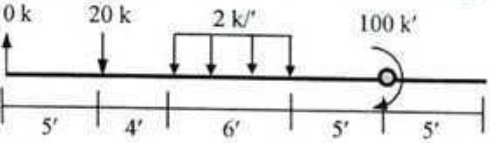

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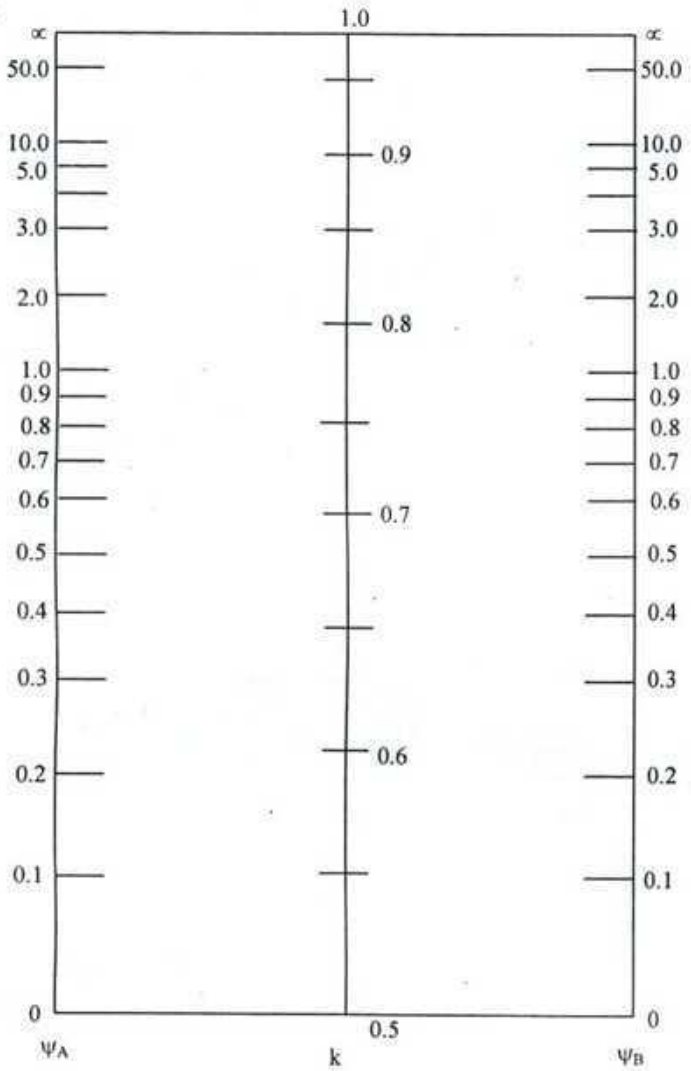
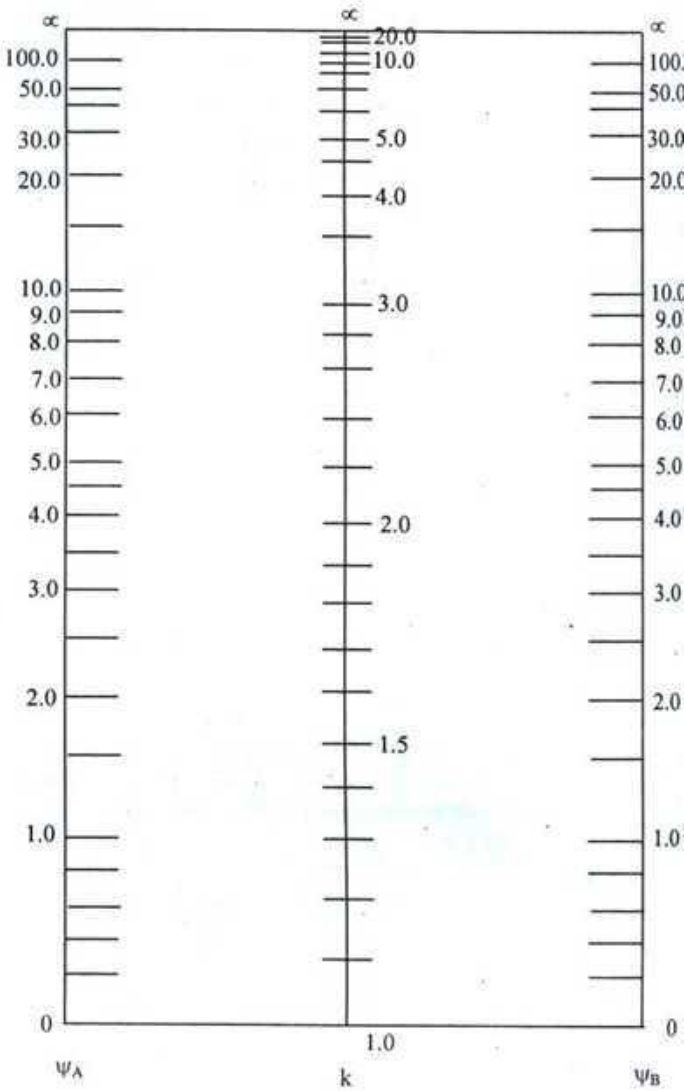


Braced Frames

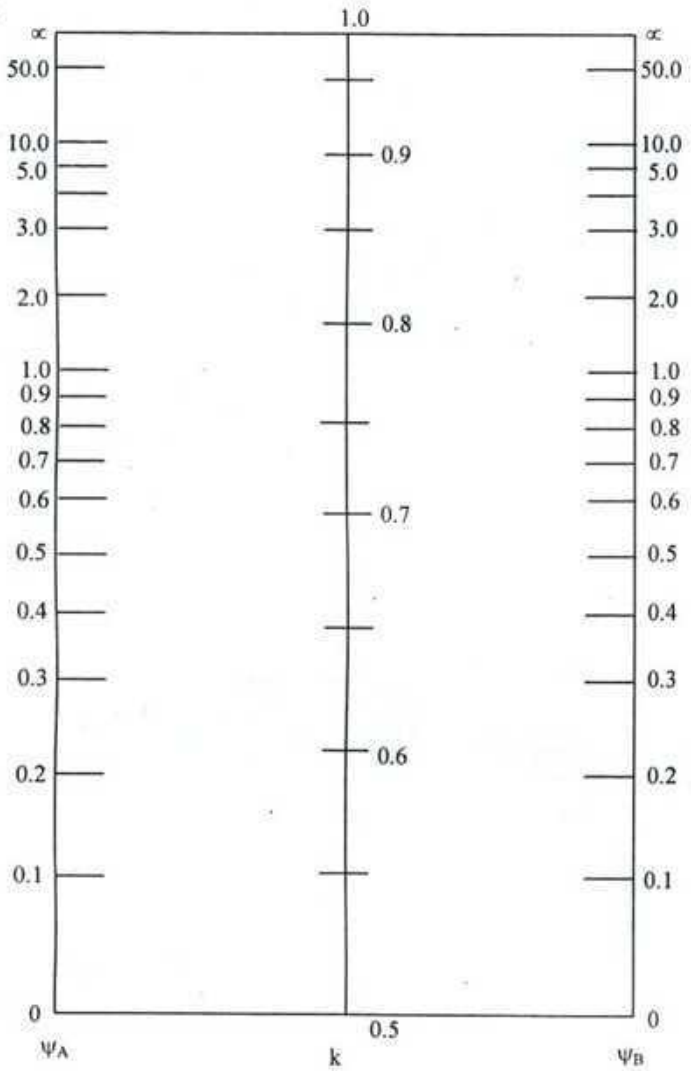


Unbraced Frames

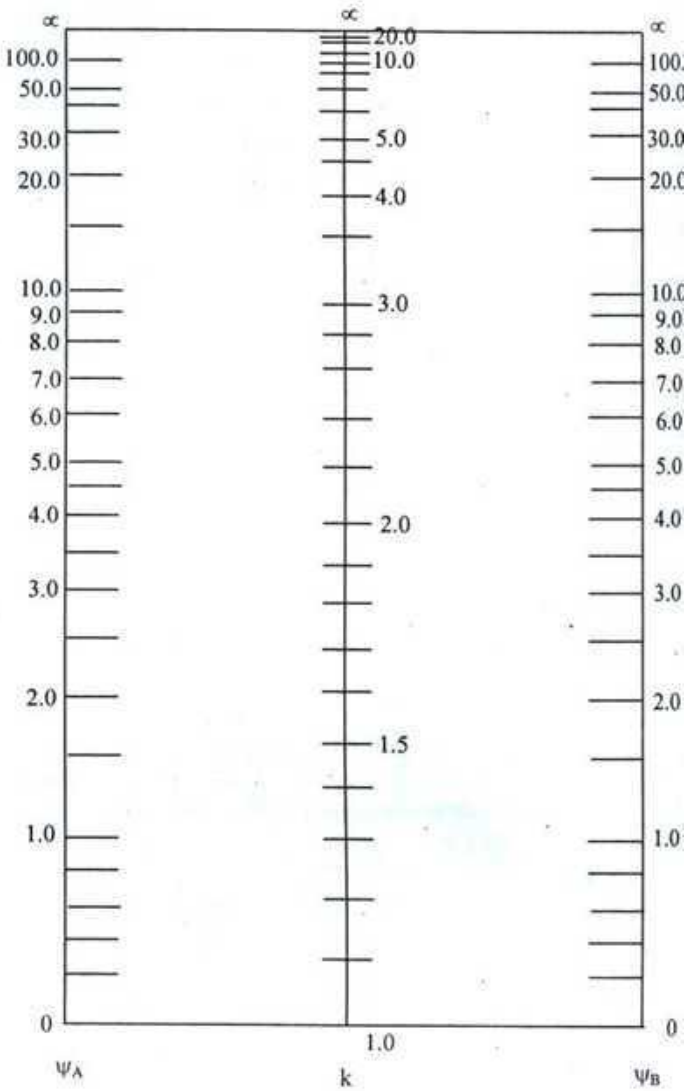
Alignment Charts for Effective Length Factors k

ψ = Ratio of ∑EI/L of compression members to ∑EI/L of flexural members in a plane at one end of a compressio member.

k = Effective length factor.



Braced Frames



Unbraced Frames

Alignment Charts for Effective Length Factors k

ψ = Ratio of ∑EI/L of compression members to ∑EI/L of flexural members in a plane at one end of a compressio member.

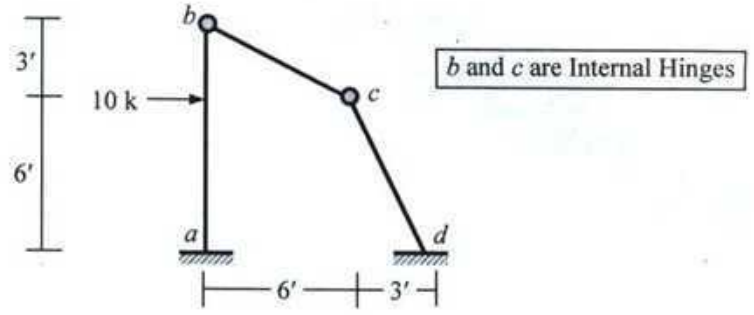
k = Effective length factor.

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008 (Set A)
Program: B. Sc. Engineering (Civil)

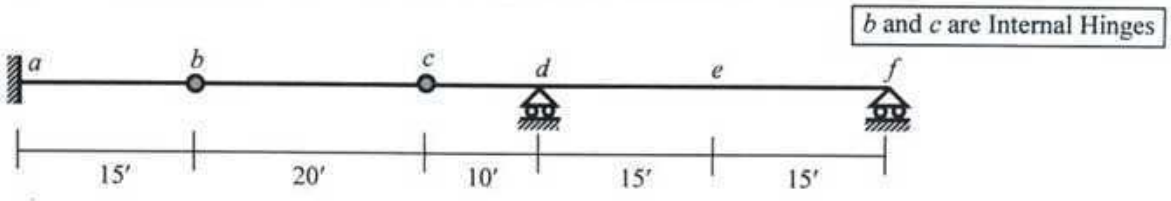
Course Title: Structural Engineering I | Credit Hours: 3.0 | Course Code: CE 311
Time: 3 hours | Full Marks: 100 (= 10 × 10)

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

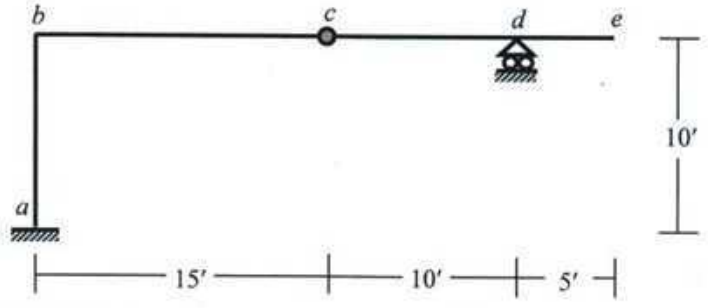
1. Determine the degree of statical indeterminacy (dosi) of the frame *abcd* shown below.
Also draw the Axial Force, Shear Force and Bending Moment diagram of the member *ab*, assuming the horizontal reactions at support *a* and *d* are equal.



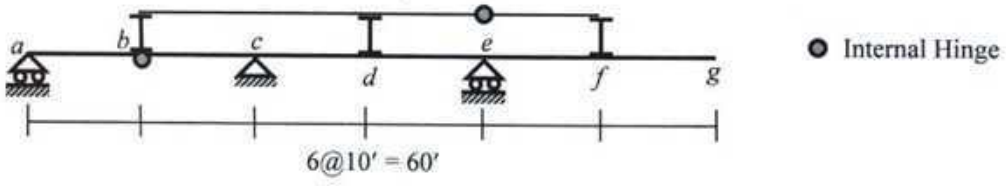
2. Show that the beam *abcdef* shown below is statically determinate.
Also draw the influence lines of (i) R_a, R_d, R_f, (ii) V_b, $V_{d(Right)}$, (iii) M_a.



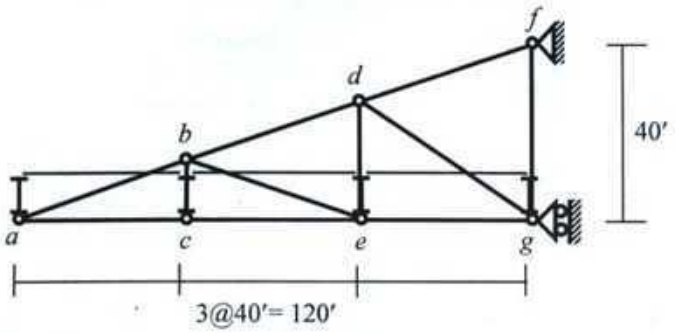
3. Determine the degree of statical indeterminacy (dosi) of the frame *abcde* shown below, and draw the influence lines of X_a, Y_a and M_a, if the unit load moves over (i) beam *be*, (ii) column *ab*.



4. Draw the influence lines of R_c, $V_{e(Left)}$, $V_{e(Right)}$ and M_c for the plate girder *abcdefg* shown below,.



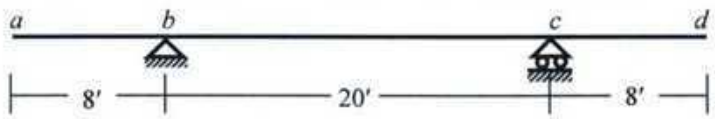
5. Determine the degree of statical indeterminacy (dosi) of the truss shown below and also draw the influence lines for the forces in members *ab*, *bc*, *bd* and *ce*.



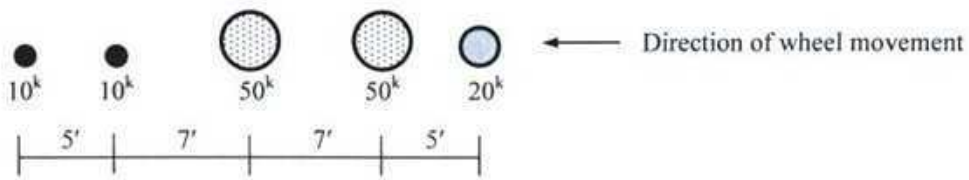
6. Calculate the maximum positive and negative values of V_e (shear force at *e*) and M_e (bending moment at *e*) for the beam *abcdef* described in Question 2, for a uniformly distributed dead load of 1 k/ft, a moving uniformly distributed live load of 0.5 k/ft and a moving concentrated live load of 10 k.

7. Calculate the maximum tensile and compressive forces in the members *ab* and *dg* for the truss *abcdefg* described in Question 5, 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 live load of 10 k.

8. Draw the design bending moment diagram of the beam *abcd* shown below for a uniformly distributed dead load of 1 k/ft and a moving uniformly distributed live load of 0.5 k/ft.

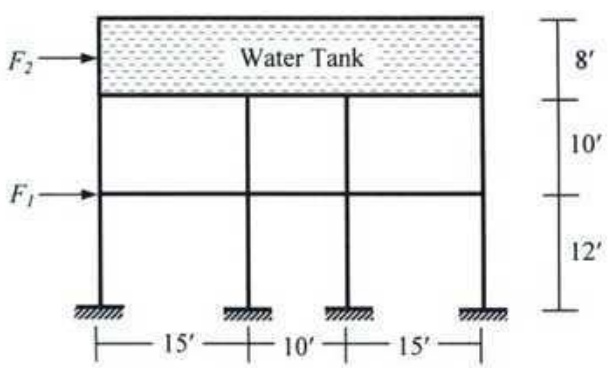


9. Calculate the maximum value of M_e (bending moment at *e*) for the plate girder *abcdefg* described in Question 4, for the moving wheel loads shown below.



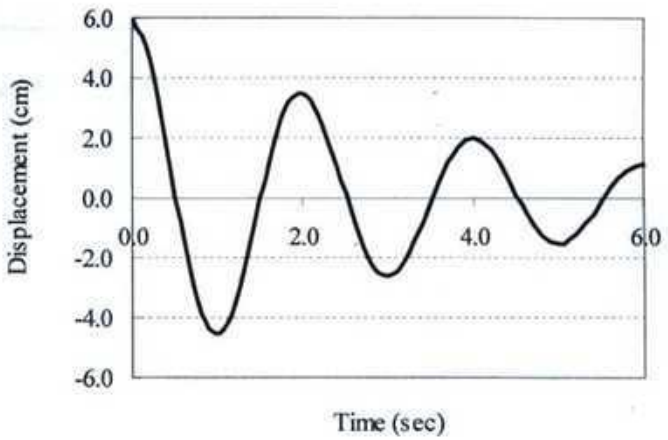
10. Calculate the greatest maximum moment in the span *bc* of the beam *abcdef* described in Question 2, for the moving wheel loads shown in Question 9.

11. The two-storied RCC frame shown in the figure below carries a 8′ deep water tank on the top floor. If the areas of the beams and columns are negligible compared to the water tank's, and the average wind coefficients are assumed to be $C_l = 1.25$, $C_z = 1.0$, $C_G = 1.2$, $C_t = 1.0$, $C_p = 1.1$, frame width = 30′, basic wind speed = 150 mph,
   (i) comment on the possible location (within Bangladesh), nature of local topography, importance and exposure for the frame based on the assumed design parameters,
   (ii) calculate the story forces F_1, F_2 and base shear due to wind.



12. The two-storied RCC frame described in Question 11 carries a water tank (weighing 15 k/ft) on the top floor. If the weight of the beams and columns are negligible compared to the water tank's, and the seismic coefficients are assumed to be $Z = 0.075$, $I = 1.25$, $S = 1.5$ and $R = 4.0$,
    (i) comment on the possible location (within Bangladesh), importance, soil condition and ductility of the frame based on the assumed seismic coefficients,
    (ii) calculate the story forces F_1, F_2 and base shear due to earthquake.

13. The free vibration response of a SDOF system (weighing 10 lb) is shown below. Calculate its
    (i) damped natural frequency and damping ratio, (ii) stiffness (k) and damping (c).



14. A simply supported RCC bridge of span L = 200 ft (weighing 500 kips) is modeled as a dynamic SDOF system with effective stiffness k = 100 k/ft and damping ratio 5%. The dynamic load applied on it by a vehicle of weight p_0 is given by $p(t) = p_0 \sin(\pi Vt/L)$, where V = Velocity of the vehicle.

    Calculate the maximum deflection of the bridge, if a vehicle weighing p_0 = 10 kips moves over it at a velocity of (i) 30 mph, (ii) 100 mph and (iii) 150 mph.

    Also comment on the results.

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) Calculation for corner reinforcements
(vi) Check for temperature and shrinkage reinforcements
(vii) Neat sketches of reinforcements (plan and one section)

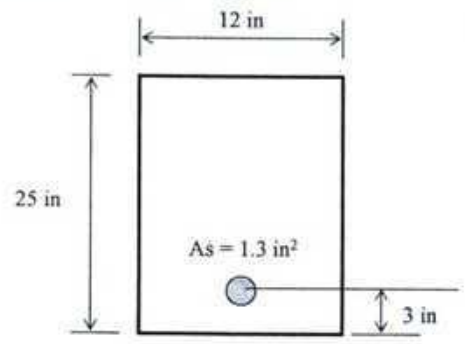
Tables for moment coefficients are attached.

3 A flat slab with drop panel and column capital is to be designed by USD for a parking garage. Column capital is a 90° truncated cone with 4 ft diameter at the intersection of the capital with the bottom of the drop panel of size 8 ft by 8 ft. Columns are 25 ft center to center in each direction. Consider LL = 200 psf, f_y = 60,000 psi, f'_c = 4000 psi. (25)

Follow the steps mentioned below in USD design:

(i) Calculation for minimum slab thickness
(ii) Check for punching shear – around column capital
(iii) Check for punching shear – around drop panel
(iv) Check for beam shear
(v) Calculation for design moments
(vi) Check for slab thickness – moment consideration
(vii) Calculation for flexural reinforcements
(viii) Neat sketches for reinforcements

4 Refer to the following section (at the middle of span) of a prestressed concrete simply supported bridge girder of span 36 feet: (25)



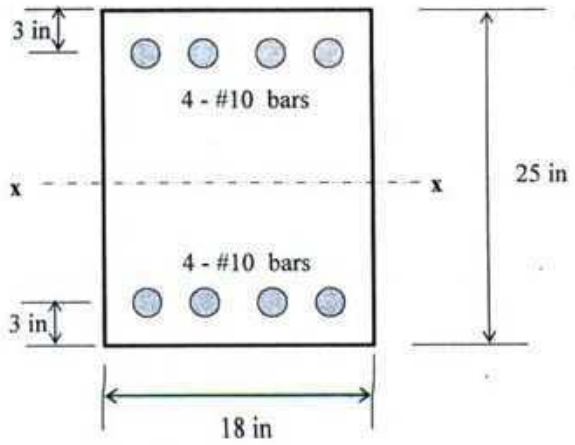
Given: f_y = 224 ksi, f_s = 256 ksi, E_s = 30 x 10^3 ksi, f'_c = 5000 psi, f_{se} = 135 ksi.

Calculate the followings:

(i) Allowable moment of the section and allowable load that can be superimposed on the beam and
(ii) Ultimate moment capacity of the section and ultimate load that can be superimposed on the beam.

Make comments on the results. Stress-strain curve of prestressing strands is attached.

5 Draw the interaction diagram of the following column section for bending about x-x axis by USD. (25)



Given: $f'_c = 3$ ksi, $f_y = 40$ ksi, $f_s = 20$ ksi

6 An isolated footing is planned under a column with the following data: (25)

Column size = 18 in by 18 in
Column reinforcements = 8 - #8 bars
DL = 225 kips, LL = 175 kips, $q_{all.} = 5$ ksf, $f'_c = 4$ ksi, and $f_y = 50$ ksi.

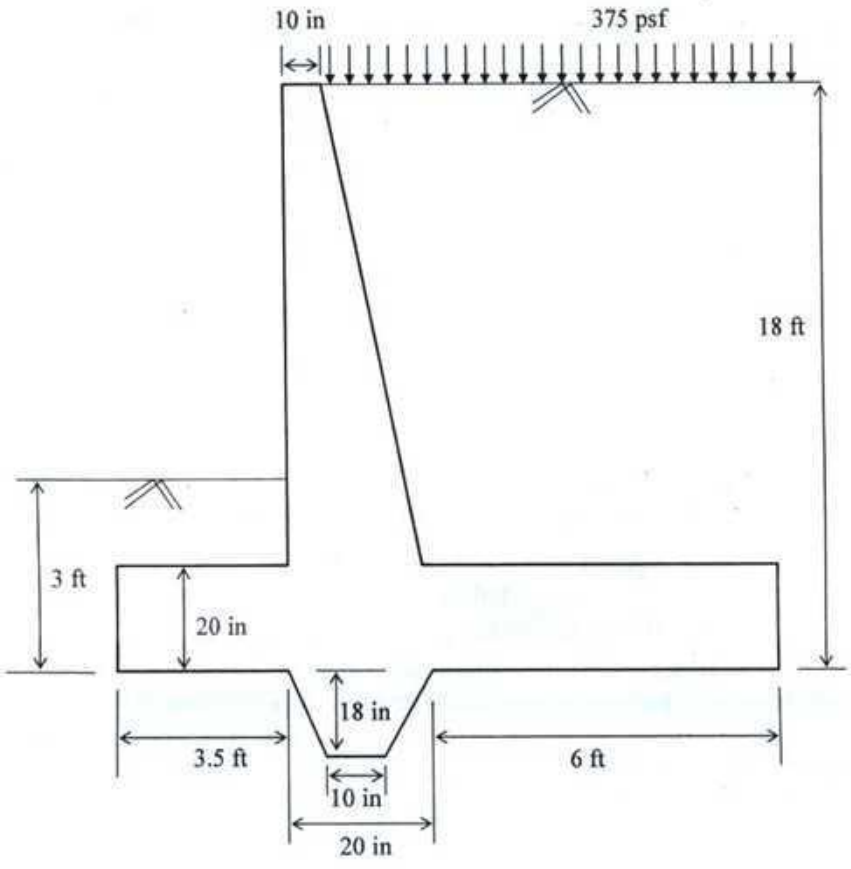
Due to site restriction, the maximum footing dimension in one direction is to be limited at 7 ft.

Design the footing by USD.

Follow the steps mentioned below:

(i) Calculation for bearing area (i.e. size of the footing)
(ii) Check thickness for punching shear
(iii) Check thickness for beam shear
(iv) Calculation for design moment and check for footing thickness
(v) Calculation for reinforcements
(vi) Check for flexural bond stress
(vii) Design for dowels
(viii) Neat sketches of reinforcements (plan and secti
(ix) ons)

7 Refer to the following cantilever retaining wall: (25)



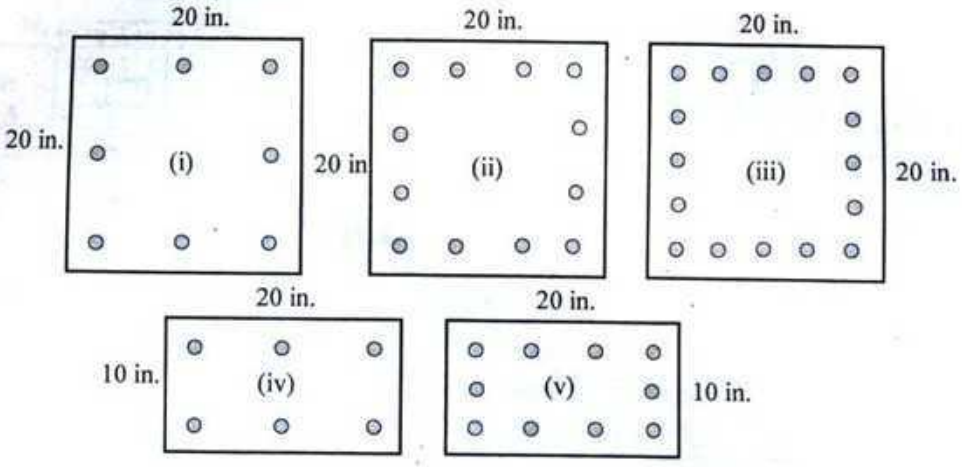
Given: $\gamma_s = 120$ pcf, $\phi = 30^\circ$, $f_{base} = 0.5$, allowable bearing pressure = 4 tsf.

All preliminary dimensions of the wall are given in the figure. Design the wall by WSD.

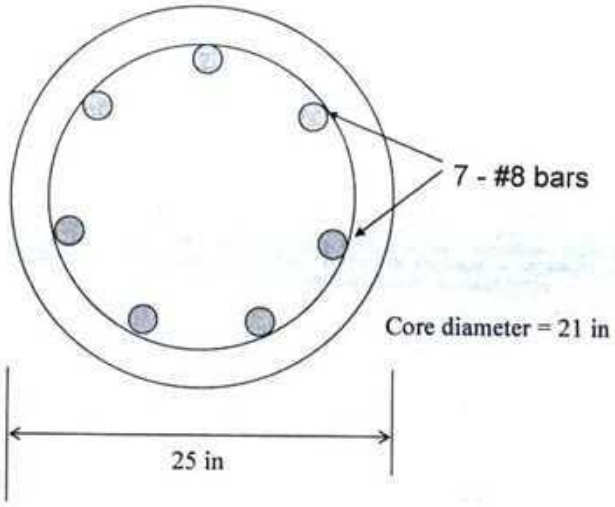
Follow the steps mentioned below:

(i) Calculation for lateral earth pressure
(ii) Calculation for design moment and thickness of the arm at base
(iii) Check for stability against overturning
(iv) Calculation for bearing pressure under the base
(v) Check for stability against sliding
(vi) Design for Arm

8(a) Draw the tie arrangements of the following column sections as per ACI Code: (10)



(b) Calculate the axial load carrying capacity of the following column section by WSD and USD. Make comments on the results. (15)



$f'_c = 3000$ psi, and $f_y = 60{,}000$ psi.

Table **Coefficients for negative moments in slabs***

$M_{A\,neg} = C_{A\,neg} \times w \times A^2$
$M_{B\,neg} = C_{B\,neg} \times w \times B^2$
where w = total uniform dead plus live load

Ratio $m = \frac{A}{B}$		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
	$C_{B\,neg}$		0.03	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 cross-hatched 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 Coefficients for dead-load positive moments in slabs*

$M_{A\ pos.\ DL} = C_{A\ DL} \times w \times A^2$
$M_{B\ pos.\ DL} = C_{B\ DL} \times w \times B^2$
where w = total uniform dead load

Ratio $m = \frac{A}{B}$		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 cross-hatched 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 Coefficients for live-load positive moments in slabs*

$$M_{A\,pos\,LL} = C_{A\,LL} \times w \times A^2$$
$$M_{B\,pos\,LL} = C_{B\,LL} \times w \times B^2$$
where w = total uniform live load

Ratio $m = \frac{A}{B}$		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	0.063
	$C_{B\,LL}$	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 cross-hatched 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.

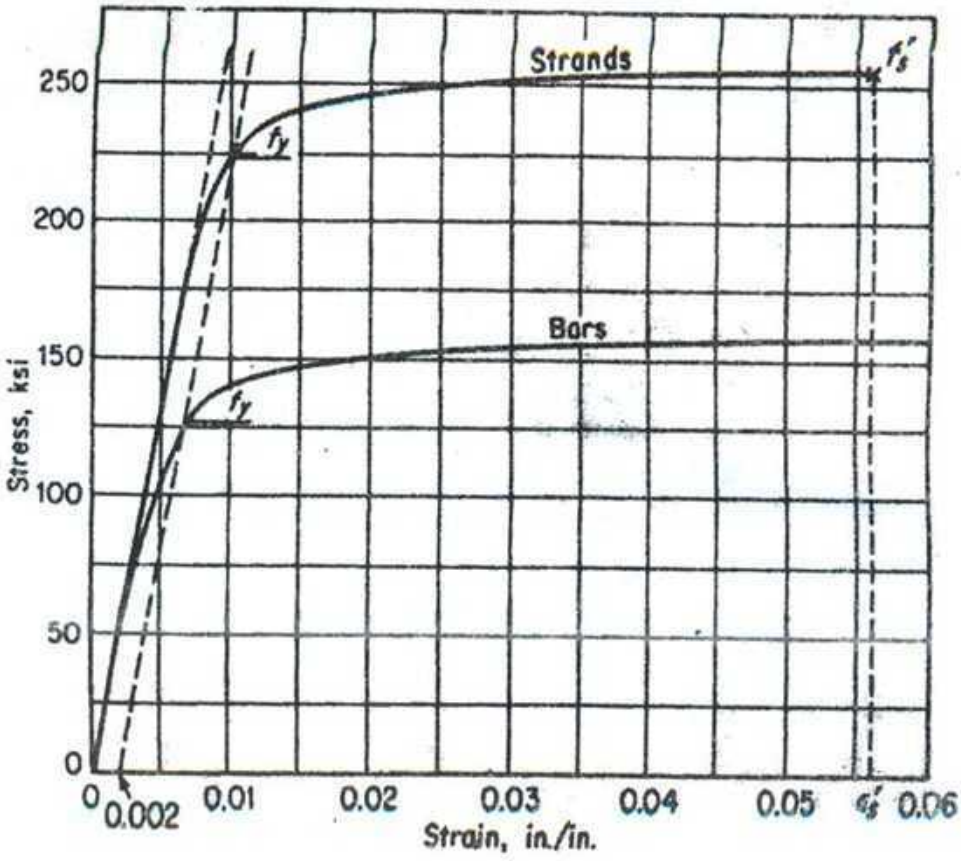


Fig. Stress-strain curves for prestressing steels.

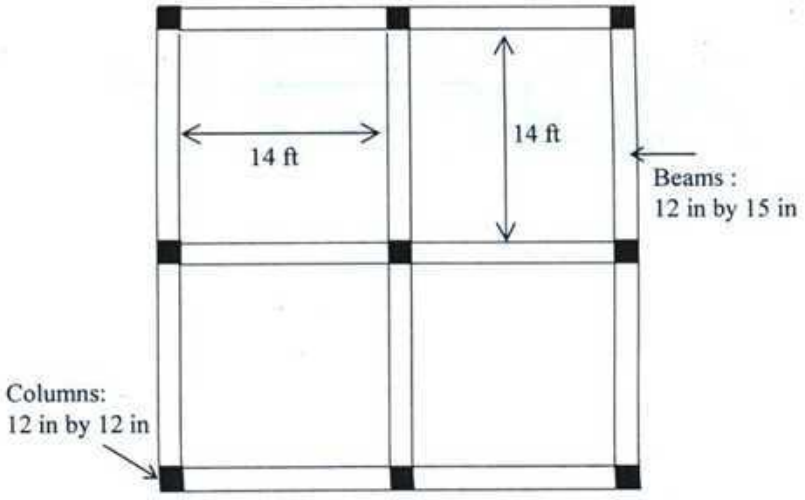
The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
Program: B. Sc. Engineering (Civil)

Course Title: Design of Concrete Structures II — Course Code: CE 317
Time: 3 Hours — Full Marks: 150

There are EIGHT Questions. Answer **any SIX Questions including Question No. 1. Question No. 1 is COMPULSORY.**

1(a)	Draw interaction diagram (schematic) (for WSD) of a column section and explain different important features of it.	(4)
(b)	Compare ordinary beam-girder floor and flat slab floor.	(3)
(c)	Compare reinforced concrete and prestressed concrete taking into consideration of sectional properties, mechanical properties (concrete and steel), deflection of structure, and cracks in concrete.	(4)
(d)	Explain the failure mechanism of tied and spiral columns.	(4)
(e)	What are the functional differences between gravity retaining wall and cantilever retaining wall? Explain the function of weep holes in retaining wall.	(3)
(f)	"Strength reduction factor (ϕ) for columns are considerably lower than those for flexure or shear" - Why?	(3)
(g)	"In two way slabs, the short direction positive steel is placed under the long direction positive steel" – Why?	(2)
(h)	Write the ACI guideline for corner reinforcement.	(2)

2 Refer to the following slab system of a two-storied building: (25)



LL = 75 psf, partition wall = 30 psf, floor finish = 15 psf, f'_c = 3,500 psi, f_s = 20,000 psi.

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
Program: B.Sc. Engineering (Civil)

Course Title: Environmental Engineering I Course Code: CE 331 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. The population in Dhaka city during the years 1996 to 2005 are shown below. Estimate the population in 2010 using least square parabola method. 12

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Population (million)	3.75	4.10	4.55	5.30	6.60	7.20	7.90	8.30	8.80	9.25

b. Explain with figure the daily variation of domestic water use. 4

c. Which factors affect the per capita consumption of water? 4

d. What are the essential elements for designing a water supply system for a city? 5

2 a. What factors should be considered in selection of site for pump station? 5

b. What are the advantages of providing gravel packing in the deep tube well? 3

c. Design a tube-well to deliver an average flow rate of 8.00×10^{-2} m^3/s at a depression head of 4 m. The average water level is 15 m below during dry season. The geological investigation have yielded the following results from site boring: 12

Depth	Type of Strata	K (mm/s)
0 to 5 m	Surface clay	0.002
5 to 20 m	Very fine sand	0.01
20 to 30 m	Clay	0.002
30 to 50 m	Coarse sand	1.50
Below 50	Clay	<0.02

Assume,

(i) Velocity of flow in the tube 2.5 m/s (ii) Pumping time = 8 hours daily
(iii) The maximum daily rate is 1.5 times the average daily rate
(iv) f=0.01 and efficiency 65% (v) Delivery head 10m

d. Briefly describe the technical advantages of "Tara Pump'. What is its primary limitation? 5

3 a. Define with neat sketches Confined, Unconfined aquifers. 6

b. State Darcy Law. 3

c. Show that the ground water yield of an unconfined aquifer can be expressed as, 10

$$Q = \frac{\pi K(D^2 - d^2)}{\log_e(\frac{R}{r})}$$

Where, Q=flow rate, K= Hydraulic Conductivity, D-d=Drawdown
R=Radius of influence, r= radius of well

d. The strainer of a 75 mm diameter tube well is sunk 40 m below static groundwater level and it fails 3 meter in the tube well while pumping. The radius of draw down is 30 m and the coefficient of permeability of the aquifer is 0.5 l/s/m^2. Calculate the probable discharge of the well. 6

4 a. What are the objectives of water treatment? 4

b. Show with neat sketch the different components of a water treatment plant. 5

c. 2500 m^3/day passes through a sedimentation tank which is 3 m wide, 15 m long and 3 m deep. Assuming that all particles with settling velocity (V_s) is greater than limiting settling velocity (V_0) will be removed completely and particles with $V_s < V_0$ will be removed in the proportion $\frac{V_s}{V_0}$, determine which size of the particle given in the following table is completely removed and which is partially removed. Given, Kinemetic viscosity of water(ν)=0.01m^2/s and ρ_S=2.65. 10

Diameter (cm)	0.0010	0.0015	0.0020	0.0025	0.0030	0.0035	0.0040

d. Explain the terms in brief (a) Coagulation (b) Disinfections 6

5 a. What is polluted, contaminated and potable water? 6

b. What types of impurities may be present in water? 4

c. Write a short note on water borne diseases. 3

d. What are the sources and environmental significances of the following water quality parameters, (i) Colour (ii) Total and Faecal Coliform (iii) Nitrate (iv) Arsenic 12

6 a. What are the current major problems to deal with the water supply system in Dhaka city? Being a planner, develop at least two suggestions about how these might be improved. 5

b. Briefly discuss the tariff charges for water supply and sanitation services in Dhaka city. 5

c. What are the present practices of water supply and system in the rural areas of Bangladesh? 5

d. Brackish sea water may be an important water source for the coastal area of Bangladesh, give your opinion. 5

e. What are the major problems of using surface water as a source of water supply in Dhaka city? 5

7 a. Discuss various methods of distributing water and discuss the advantages and disadvantages of each. 5

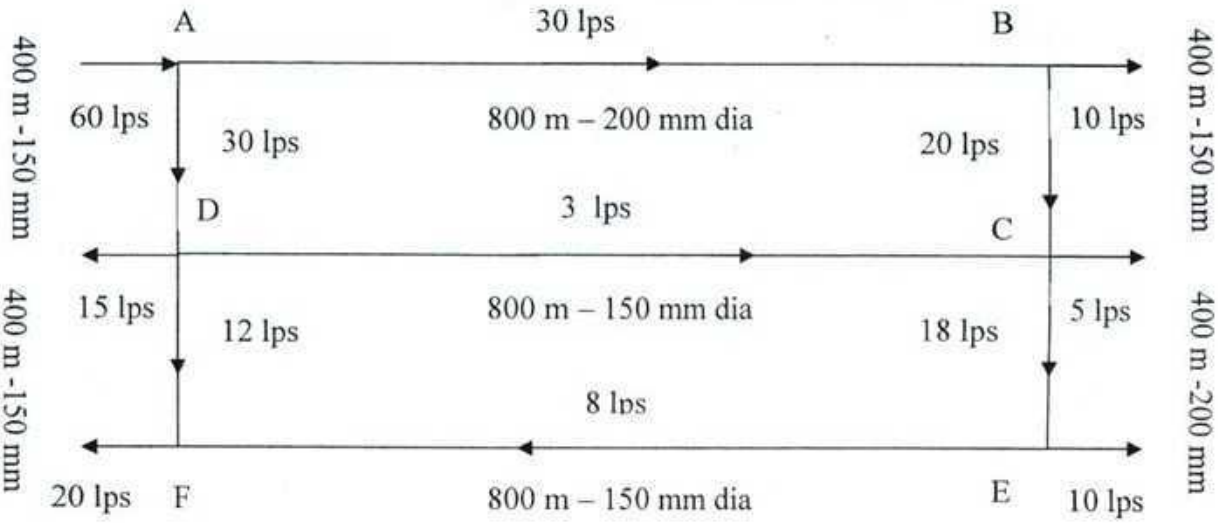
b. An elevated cylindrical water tank of 3650 m^3 capacity has to be designed for water supply system for a locality. If concrete work per square meter in the floor and wall of shell costs Tk.550.00 and Tk.800.00 respectively, what would be the most economical radius and height of the storage tank? 10

c What are the general requirements to be kept in view in the design of distribution system? 5

d Which type of water distributing system is generally used in Dhaka city? 5

8 a. Describe with neat sketch the grid iron system of distribution network in a water supply system and state their advantages and disadvantages. 5

b. The water flows at different branches are assumed as follows, 20



Calculate with the help of hardy cross method the actual flows through the pipes.

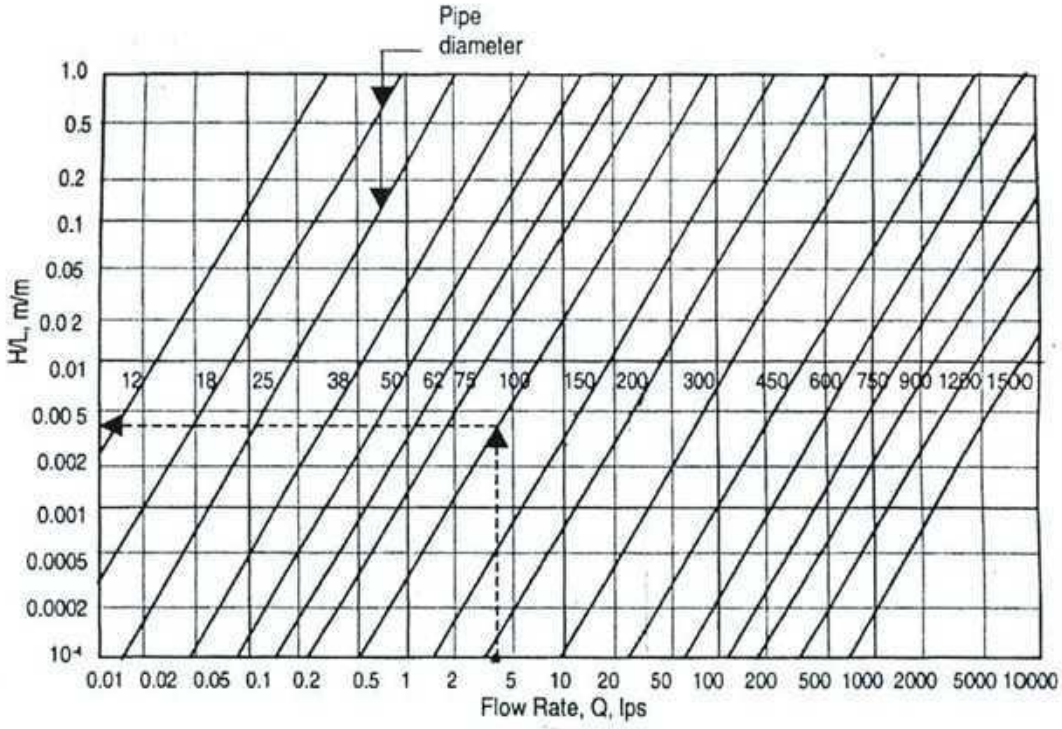


Figure: Head loss determination diagram (for C=120)

FORMULAE:

1. $Y = a + bX + cX^2$
2. $\sum Y = aN + b\sum X + c\sum X^2$
3. $\sum XY = a\sum X + b\sum X^2 + c\sum X^3$
4. $\sum X^2Y = a\sum X^2 + b\sum X^3 + c\sum X^4$
5. $H = h_e + h_f + h_v$
6. $h_v = \frac{V^2}{2g}$
7. $h_f = \frac{4flv^2}{2gd}$
8. $H.P = \frac{wQH}{75\eta}$
9. $V_0 = H/T$
10. $T = V/Q = BLH/Q$
11. $V_0 = Q/BL$ = Q/Surface Area
12. Surface loading = Q/BL
13. $Vs = g * (S-1) * d^2 / (18 * \nu)$
14. $Q = \frac{\pi K(D^2 - d^2)}{\log_e(\frac{R}{r})}$
15. $Q = \frac{2\pi Km(D-d)}{\log_e(\frac{R}{r})}$
16. $\frac{H}{L} = \frac{1.59 \times 10^6 Q^{1.85}}{D^{4.87}}$
17. $\Delta = -\frac{\sum H}{1.85\sum \frac{H}{Q_a}}$

7. (a) What are the different factors that are responsible for large bicycling demand?
(b) Draw diagrammatic profile of attaining super elevation (pavement revolved about center line).
(c) Following data was collected while conducting speed studies at certain section of a road. Determine- Design speed and 85th percentile speed.

Observation No.	Speed (kph)
1.	40.8
2.	52.8
3.	51.6
4.	46.2
5.	55.1
6.	48.8
7.	41.2
8.	51.6
9.	47.8
10.	52.6
11.	32.2
12.	57.5
14.	58.2
15.	47.8
16.	53.7
17.	42.6
18.	66.6

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
Program: B.Sc. Engineering (Civil)

Course Title: Transportation Engineering I: Transport & Traffic Design | Course Code: CE 351 | Credit: 3.00

Time: 3 Hours | Full Marks: 100

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

1. (a) What are the different traffic engineering tools to eliminate traffic congestion? (7)
   (b) Draw a typical road junction. (3)
   (c) Design a two-phase signal of an isolated cross-junction for the following data. And also find saturation flow. Assume any other missing data. (10)

	N – S	E – W
Inter-green (sec)	9	7
Lost time (sec)	3	2

		N	S	E	W
Arrival flow	(PCU/hr)	760	550	600	700
Saturation flow	(PCU/hr)	2000	1950	1800	1800

2. (a) Briefly explain the different government policies on transport planning in Bangladesh. (12)
   (b) What are the different controls and criteria in geometric design? (3)
   (c) Describe different constraints in waterways and railways in Bangladesh. (5)

3. (a) What are different factors that affect the development of transportation system? (7)
   (b) Classify and define the new road classification in Bangladesh. (6)
   (c) Calculate super elevation rate for a roadway with a design speed of 75 mph and a degree of curve 4^0, assume f = 0.11. (5)
   (d) Write a short note on channelized islands. (2)

4. (a) Write down the names of different ministries involved in the transportation control and management system in Bangladesh. (10)
   (b) Write a short note on road markers. (7)
   (c) Mention the places where parking should be prohibited. (3)

5. (a) Classify and describe traffic signs according to function. (8)
   (b) What are the common causes of parking related accidents? (4)
   (c) What is transition curve? (3)
   (d) What are the general requirements of traffic control devices? (5)

6. (a) Briefly differentiate between (6)
      i) Running speed and Journey speed
      ii) Free flow and Forced flow
      iii) Non-recurrent delay and recurrent delay
   (b) Write down the objective of traffic volume studies. (5)
   (c) What is variable message Signs? (3)
   (d) Write short notes on i) right of way ii) shoulder iii) pavement crown. (6)

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall- 2008
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.

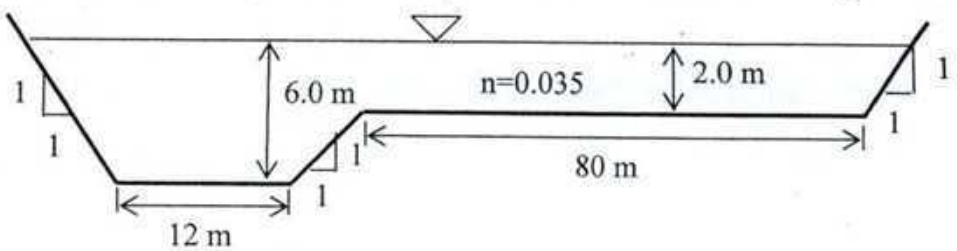
1 a. Define Pressurised and Open Channel Flow. "It is much more difficult to solve problems in open channels than in pressure pipes"-Justify the statement. 5

b. 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 curve may be expressed as $u = y^2 + 2y + 1$. Where, y = depth of flow measured from the channel bottom. During calculation divide the depth of flow into five equal zones. 6

c. Prove that at the critical state of flow the velocity head is equal to the half of the hydraulic depth e.g. $\frac{V^2}{2g} = \frac{d}{2}$, where 'V' is the average velocity and 'd' is the hydraulic depth and 'g' is the acceleration due to gravity. 6

d. A rectangular channel carrying 75 m^3/s water has a bottom width of 8.0 m. Find (a) Critical depth and energy (b) Super and Sub-critical flow depth when the energy is 7.48 m. 8

2 a. For the compound channel shown in figure below, determine the discharge if S=0.0002. 7



b. Define (a) Normal slope, and (c) Critical slope at a given normal depth. 6

c. A trapezoidal channel carrying 40 m^3/s water has a bottom width of 8.0 m, side slopes of 2:1, and n=0.025. Determine (i) the normal slope at a normal depth of 2.50 m (ii) critical slope and the corresponding normal depth, and (iii) critical slope at the normal depth of 1.50 m and & compute the corresponding discharge. 12

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

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

c. A concrete lined trapezoidal channel (n=0.015) is 8.0 m wide and has a side slope of 2H:1V. The longitudinal slope is 0.006. Estimate the normal depth in this channel for a discharge of 75 m^3/s. 8

d. An earthen trapezoidal channel (n=0.020) has a bottom width of 4.0 m, side slope of 2.0 H : 1 V and a uniform flow depth of 1.50 m. It is observed from an economic study that seepage is minimum when canal sides are lined only with smooth concrete (n = 0.010), determine the equivalent roughness of the channel. 6

4 a. Briefly discuss the practical applications of hydraulic jump. 5

b. Draw typical velocity distribution curve at a section in hydraulic jump. 4

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

d. A spillway discharges a flood flow at a rate of 10.00 m^3/s per metre width. At the downstream horizontal apron the depth of flow was found to be 0.75 m. What tail water depth is needed to form a hydraulic jump? If a jump is formed, find its (i) type (ii) length and (iii) head loss. 8

5 a. A rectangle channel 2.0 m wide has a discharge of 1.45 m^3/s. Find the height of a rectangular weir spanning the full width of the channel that can be used to pass this discharge while maintaining an upstream depth of 1.50 m. 8

b. A right angled triangular notch discharges under free-flow conditions. Estimate the discharge if the heights of water surface measured above the vertex of the notch is 0.60 m. (Assume C_d=0.75) 5

c. A rectangular channel is 3.5 m wide and conveys a discharge of 15.0 m^3/s at a depth of 2.0 m. It is proposed to reduce the width of the channel at a hydraulic structure. Assuming the transition to be horizontal and the flow to be frictionless determine the water surface elevations upstream and downstream of the constriction when the constricted width is 2.00 m. 12

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. A trapezoidal section is to be built of rough un-sized timber (n=0.011) with a drop of 2 m in a km. What will be the depth of water for most efficient section for a flow of 1.1 m^3/s? 5

c. Find out the height and width of a stable canal (0.5 H : 1V) using Kennedy's equation to carry a discharge of 15 m^3/s at a slope of 2 $x10^{-4}$. Given, n = 0.025 and m=0.90. 6

d. Find out the height and width of a regime channel (0.5 H : 1V) to carry 10 m^3/s using Lacey's equation. Mean sediment size of the sand is 0.5 mm. 6

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

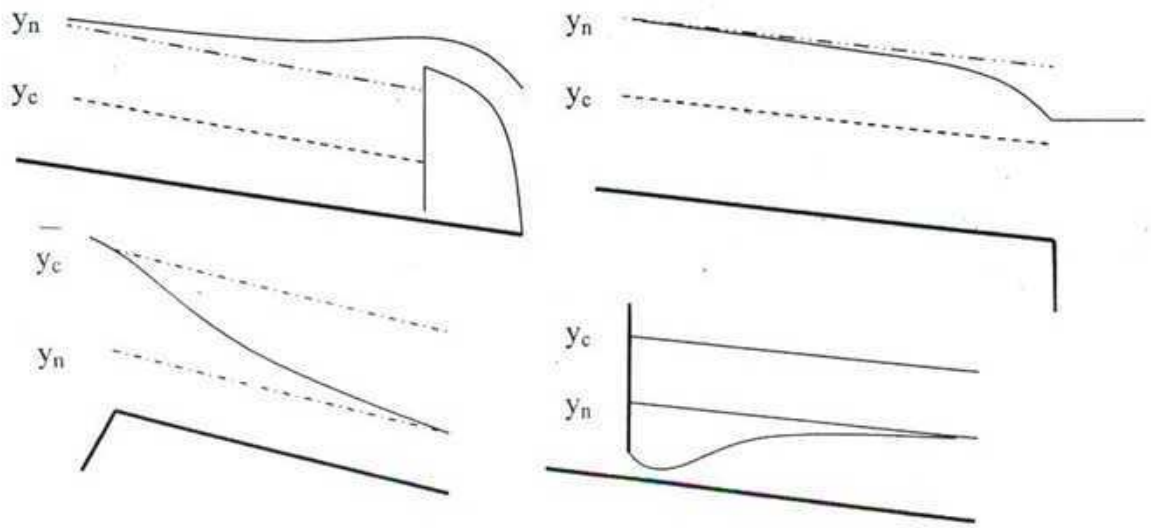
b. What are the reasons for lining channels? 4

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

d. Design a canal to carry 50.00 m³/s of clear water through 4.0 mm gravel (manning's roughness coefficient =0.0148 and angle of Repose 37°) on a slope of 10^{-4}. The canal is to be trapezoidal in shape having side slopes of 1.5 H: 1 V. The average temperature = 20°c for which $\nu = 10^{-6}$ **m²/s and** ρ_s **= 2.65.** 12

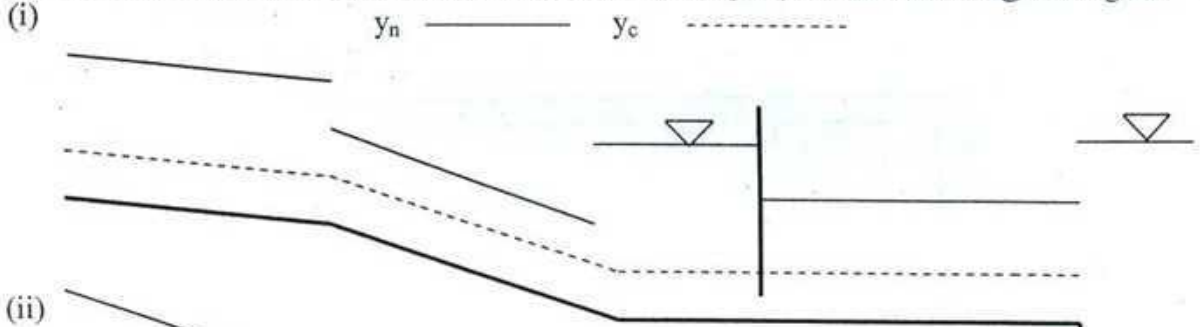
8 a. In the dynamic equation of gradually varied flow, $\frac{dy}{dx} = \frac{S_0 - S_f}{1 - \frac{Q^2 T}{gA^3}}$, explain each term of the equation. 7

b. Identify the flow profiles for the following structures, 8

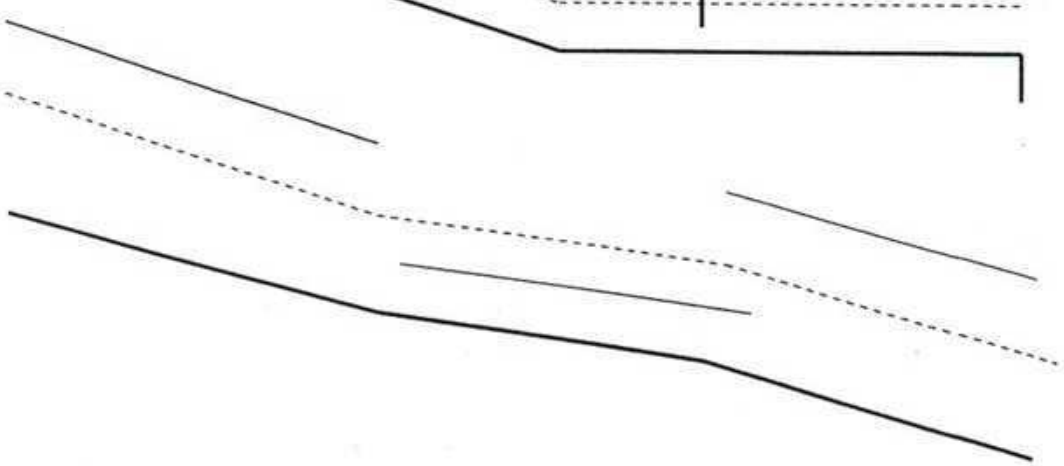


b. Sketch the possible flow profiles (at least one for each figure) for the following two figures 10

(i)



(ii)



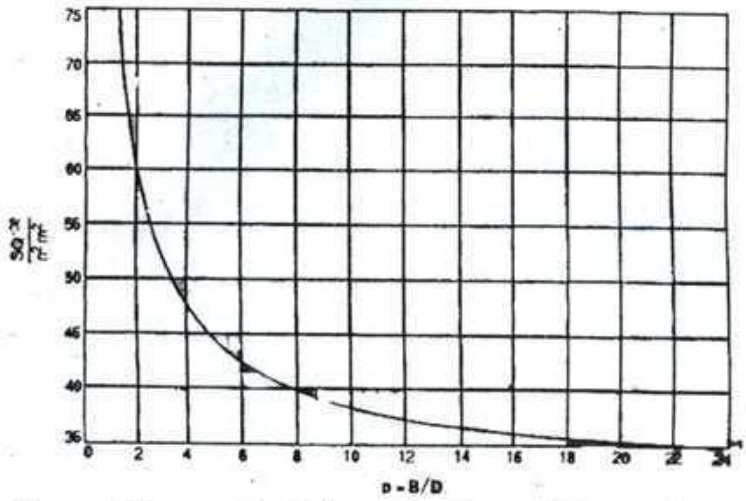


Figure: Diagram for design using Kennedy's equation

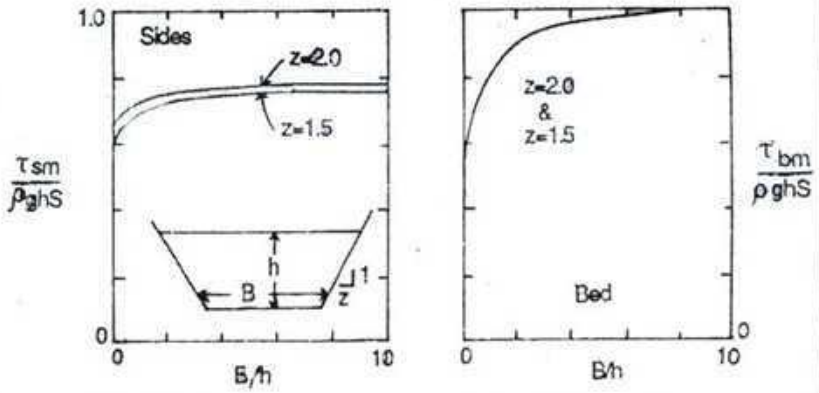


Figure: Maximum shear stresses on bed and sides of smooth trapezoidal channels

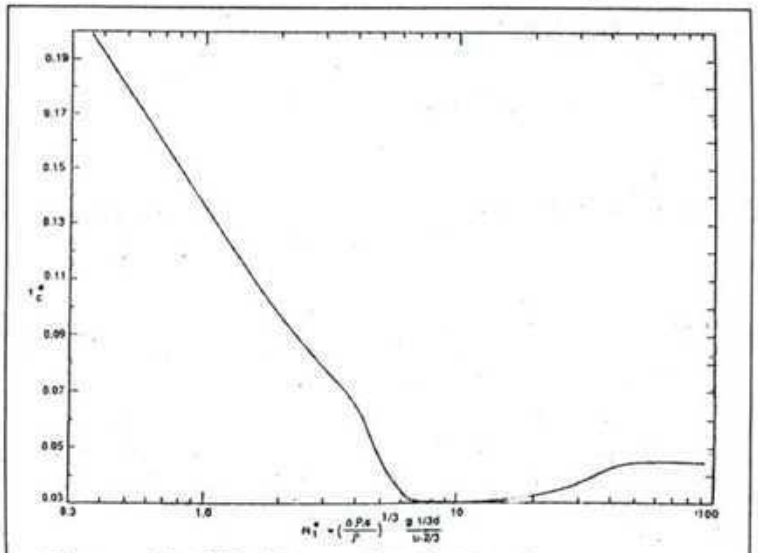


Figure: Modified form of Yalin-Karahan curve

FORMULAE

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

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

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

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

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

15. $Q = \frac{2}{3} C_d \sqrt{2g} L H_1^{\frac{3}{2}}$ 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. $Q = \frac{8}{15} C_d \sqrt{2g} \tan\theta H_1^{\frac{3}{2}}$ 19. $V = \frac{1}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$ 20. $n = \frac{d_{50}^{\frac{1}{6}}}{21.1}$ 21. $n = \frac{d_{90}^{\frac{1}{6}}}{26}$

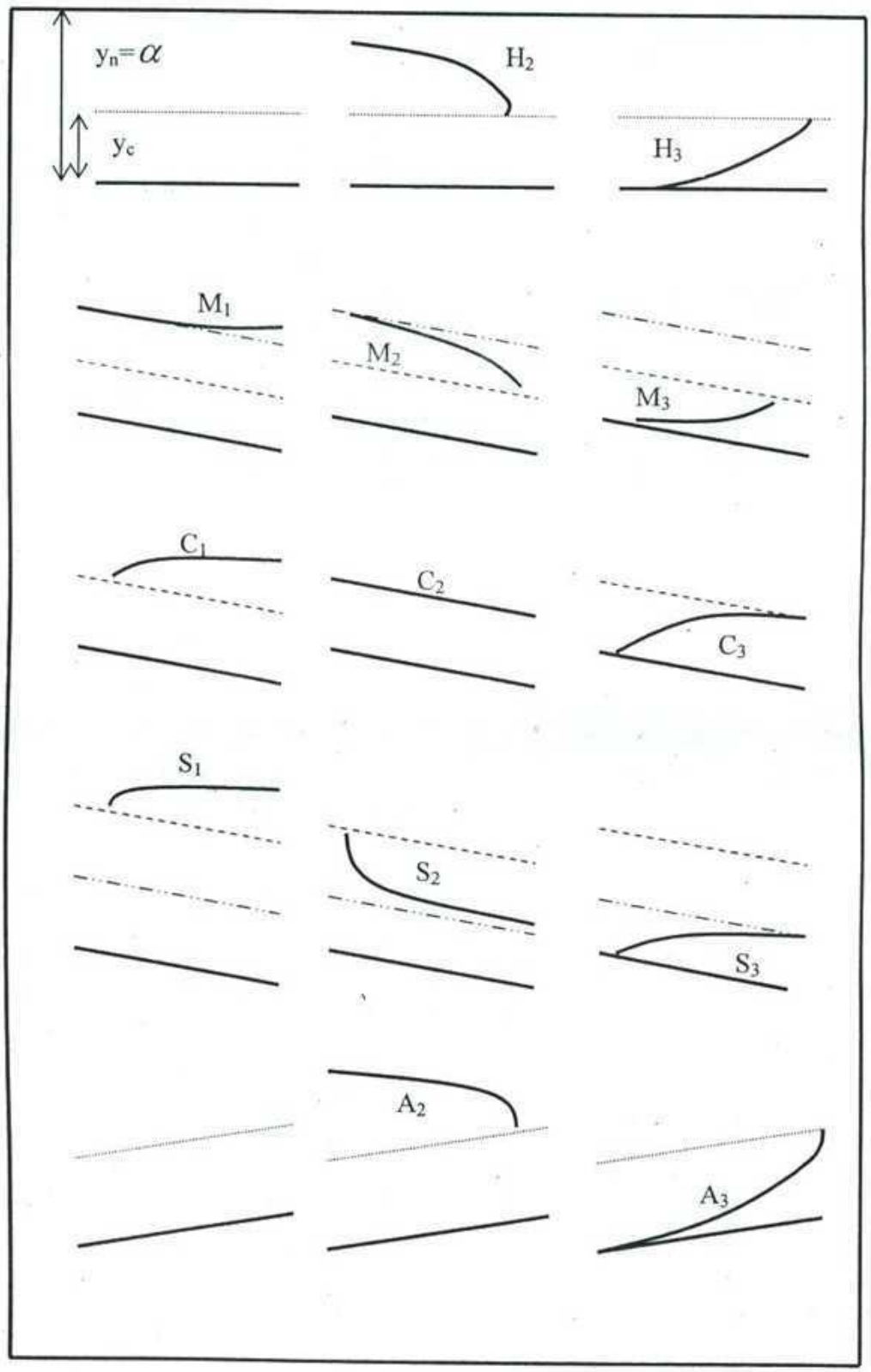
22. $n_{eq} = \frac{(\sum n_i^{\frac{3}{2}} P_i)^{\frac{2}{3}}}{P^{\frac{2}{3}}}$ 23. $\frac{\tau_s}{\tau_b} = K = \cos\theta \sqrt{1 - \frac{\tan^2\theta}{\tan^2\phi}}$ 24. $\tau_b = 0.90\tau_c$

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

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. $\frac{Q^2}{g} = \frac{(B + zy_c)^3 y_c^3}{B + 2zy_c}$ 30. $B_c = 1.84 \frac{Q}{\sqrt{g} E_1^{\frac{3}{2}}}$

31. $E_1' = 1.5y_c = E_c$ 32. $h = \left[\dfrac{1.818Q}{(p+0.5)m}\right]^{0.378}$ 33. $P = 4.75\sqrt{Q}$

34. $R = 0.47\left(\dfrac{Q}{f_s}\right)^{\frac{1}{3}}$ 35. $S = 3\times10^{-4} f_s^{\frac{5}{3}} / Q^{\frac{1}{6}}$ 36. $f_s = 1.76\sqrt{d}$



The University of Asia Pacific
Department of Civil Engineering
Final Examination, Fall 2008
Program: B.Sc Engineering (Civil)

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

There are EIGHT questions answer any SIX
(Assume any reasonable data if not given)

1. (a) Explain the following (any Three) (9)
   i) Consistency test for rainfall records
   ii) Estimating the missing rainfall data
   iii) Pan coefficient
   iv) Φ-index
   v) Initial loss to reduce the water volume available for runoff

   (b) Distinguish between the following (any Four) (8)
   i) Recording and non-recording rain gauges
   ii) Cold and warm fronts.
   iii) Infiltration capacity and infiltration rate
   iv) Evaporation and transpiration
   v) Storm hydrograph and Direct runoff hydrograph
   vi) Infiltrometer and Lysimeter

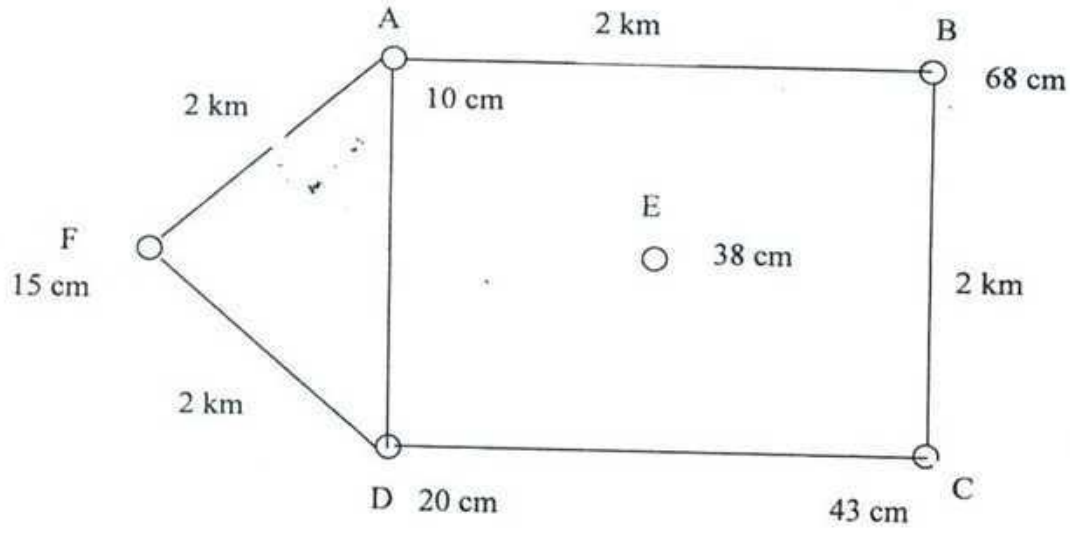
   (c) The following data were collected for a 24m wide stream at a gauging station. Compute the discharge. (8)

Distance from one end of water surface (m)	depth, d (m)	Immersion of current meter at 0.6d below water surface	
		Rev.	Sec
3	1.4	12	50
6	3.3	29	53
9	5.0	35	56
12	9.0	42	59
15	5.4	32	51
18	3.8	33	53
21	1.8	18	50

Calibration equation of current meter: $v = 0.3N + 0.05$, N = revolutions per seconds, v = velocity, m/s.

2. (a) A reservoir had an average area of 20 km^2. In a particular month the mean rate of inflow = 10 m^3/s, outflow = 15 m^3/s, monthly rainfall = 10 cm and increase in storage = 16 million m^3. Assuming the seepage losses to be 1.8 cm, estimate the evaporation in that month. (10)

(b) Find the mean precipitation for the area shown below by Thiessen polygon method. The area is composed of a square plus an equilateral triangular plot of side 2 km. Rainfall readings are in cm at the various stations indicated. (15)



3. (a) What are the factors that affect the shape of a flood hydrograph? Describe the different methods of base flow separation. (8)

(b) Describe the analysis of the recession limb of a flood hydrograph. (5)

(c) The following are the ordinates of the hydrograph of flow from a catchment area of 780 km^2 due to a 6-hr rainfall. Derive the ordinates of 6-hr unit hydrograph for the basin. Make suitable assumptions regarding base flow. (12)

Time (hr)	6	12	18	24	30	36	42	48
Discharge(cumec)	40	64	215	360	405	350	270	205

Time (hr)	54	60	66	72	78
Discharge(cumec)	145	100	70	50	42

4. (a) What are the assumptions of a unit hydrograph? (3)

(b) Explain the procedure of deriving a synthetic unit hydrograph for a catchment by using Snyder's method. (10)

(c) The ordinates of 4-hr UH are given below. Derive the ordinates of an 8-hr UH by the S-curve method. (12)

Time (hr)	0	4	8	12	16	20	24	28
4-hr UH ordinates (cumec)	0	24	82	159	184	151	103	64

Time (hr)	32	36	40	44
4-hr UH ordinates (cumec)	36	17	6	0

5. (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 for the following data by Penman's formula: (10)

i) Slope of the saturation vapour pressure vs. temperature at the mean air temperature = 1.00 mm/°C
ii) Mean temperature = 19°C
iii) Relative humidity = 75%
iv) Wind velocity at 2 m height = 85 km/day
v) Saturated vapour pressure e_w = 16.5 mm of Hg
vi) Net radiation = 1.99 mm of water per day
vii) Psychrometric constant = 0.49 mm of Hg/°C

6. (a) How does channel routing differ from reservoir flood routing? What are the factors to be considered in choosing the routing period? (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 (hr)	Inflow (cumec)	Outflow (cumec)
0	20	20
12	191	30
24	249	120
36	164	176
48	110	164
60	82	135
72	62	116
84	48	90
96	32	68
108	28	52

7. (a) Derive the required expression and different steps for reservoir routing. What data are required for reservoir routing? (10)

(b) The inflow hydrograph readings for a channel reach are given for which the Muskingum coefficients of k=30 hr and x=0.2. Route the flood through the reach and determine the attenuation and time lag of outflow. Outflow at the beginning of the flood may be taken as the same as inflow. (15)

Time (hr)	0	12	24	36	48	60	72	84	96
Inflow (cumec)	15	16	34	96	121	102	85	70	57
Time (hr)	108	120	132	144	156	168	180	192	204
Inflow (cumec)	47	39	32	28	24	22	20	19	18
Time (hr)	216	228	240						
Inflow (cumec)	17	16	15						

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

(b) Annual maximum recorded floods in a tributary of the river Brahmaputra for the period 1939 to 1968 is given below which fits well the Gumbel extreme value distribution. Estimate the flood discharge with recurrence interval of (i) 100 years and (ii) 150 years. Also find 95% confidence limits for these estimates. (18)

Year	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Flood (cumec)	14570	8440	14000	22620	4820	29300	24200	12450	7270	6230
Year	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958
Flood (cumec)	18300	9680	6480	3680	11430	21240	8500	9720	5810	19650
Year	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Flood (cumec)	37300	7220	20860	18700	7650	6090	4390	10340	12880	42450

TABLE: 1 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									

TABLE: 2 REDUCED STANDARD DEVIATION S_n IN GUMBEL'S EXTREME VALUE DISTRIBUTION

N = sample size

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									

TABLE: 3 Values of function of the confidence probability c.

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 2008

Course #: CE 401 — Course Title: Project Planning and Management
Full Marks: 100 (5 × 20) — Time: 3 hours

There are **7 (seven)** questions. Answer **any 5 (five)**

Q. 1. (a) Do you think conflict is beneficial to the project organization? If no, why? If yes, how can it be beneficial? Explain. (5)

(b) Elaborate how to collect data in monitoring a project. (8)

(c) For the following cash flow table, select the project to be accepted based on Net Present Value and Pay Back Period (discount rate of 12%). (7)

Year	Project A	Project B
0	Tk. -100,000 (Investment)	Tk. -100,000 (Investment)
1	50,000	20,000
2	30,000	20,000
3	20,000	20,000
4	10,000	40,000
5	10,000	50,000
6	-	60,000

Q. 2. (a) What are the basic reasons for crashing a project? Explain. (6)

(b) How do you judge the influence of "Post control" in controlling a project? Discuss the 4 distinct sections of this type of control. (8)

(c) Consider a project that requires 25 units of products to be produced. An expert worker takes 12 hrs to complete a single part. However, 20 parts need to be produced for a worker to be an expert at 75% learning rate. If the hourly wage rate is Tk. 200, what is the amount that the budget will be underestimated if learning rate is not taken into consideration? (6)

Q. 3. (a) Explain 3 different types of cybernetic control system. (10)

(b) For the following task table, draw the AON network diagram, find critical path and calculate total duration of the project as well as slack time for each element. (10)

Task	Follower	Duration (days)
A	------	5
B	A	4
C	A	6
D	B	8
E	C	5
F	D, E	9
G	F	3
H	F	7

Q. 4. (a) What problems does a PM usually face in allocating resources? (4)

(b) Note down the benefits and limitations of GANTT chart over Network. (4)

(c) For the following task table, find different possible crash times and corresponding costs for the project. (12)

Activity	Predecessor	Duration		Cost	
		Normal	Crash	Normal	Crash
a	----	3	2	40	70
b	a	3	3	50	50
c	a	3	2	20	50
d	a	4	2	50	110
e	b	3	1	10	70
f	c, d, e	2	1	40	60

Q. 5. (a) Do you think EOQ model can be applied without any assumptions? If not, what are the assumptions? (6)

(b) What do you mean by PERT and CPM? How do you differentiate between them? (4)

(c) Find the EOQ for the following data: (10)

Annual Demand	= 1000 unit
Ordering cost	= $ 10 per order
Holding cost	= $ 3 per unit per year
Cost per unit	= $ 20 for lot size 1~49
	= $ 19 for lot size 50~99
	= $ 18.5 for lot size 100~149
	= $ 18 for lot size 150~199
	= $ 17.5 for lot size 200~up

What will be the total cost for this amount of order quantity including material price?

Q. 6. A toy manufacturer produces two different types (Type A and Type B) of toy using 1000 pounds of material and 40 hours of production time available. The manufacturer is not allowed to produce more than 650 toys which is the maximum demand provided by the marketing department. Number of toy type B should not exceed the number of toy type A by more than 50 units. One unit of toy type A needs 2 pounds of material and 3 minutes of labor; whereas for toy type B, it takes 1 pound of material and 4 minutes of labor.

If toy type A and B give profit margins of $8 and $5 per unit respectively, determine the optimum number of units of A and B to be produced.

Also calculate the maximum profit. (20)

Q. 7. (a) Explain different contract styles in construction management. (6)

(b) Write down the main causes of accidents in construction works. (6)

(c) Write short notes on: (4 × 2 = 8)

I. Physical asset control

II. Human resources control

Learning Rate Coefficients

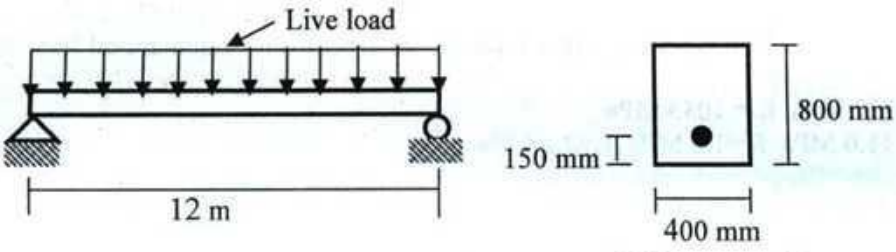
Unit Number	70%		75%		80%		85%		90%	
	Unit Time	Total Time	Unit Time	Total Time	Unit Time	Total Time	Unit Time	Total Time	Unit Time	Total Time
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	0.700	1.700	0.750	1.750	0.800	1.800	0.850	1.850	0.900	1.900
3	0.568	2.268	0.634	2.384	0.702	2.502	0.773	2.623	0.846	2.746
4	0.490	2.758	0.563	2.946	0.640	3.142	0.723	3.345	0.810	3.556
5	0.437	3.195	0.513	3.459	0.596	3.738	0.686	4.031	0.783	4.339
6	0.398	3.593	0.475	3.934	0.562	4.299	0.657	4.688	0.762	5.101
7	0.367	3.960	0.446	4.380	0.534	4.834	0.634	5.322	0.744	5.845
8	0.343	4.303	0.422	4.802	0.512	5.346	0.614	5.936	0.729	6.574
9	0.323	4.626	0.402	5.204	0.493	5.839	0.597	6.533	0.716	7.290
10	0.306	4.932	0.385	5.589	0.477	6.315	0.583	7.116	0.705	7.994
11	0.291	5.223	0.370	5.958	0.462	6.777	0.570	7.686	0.695	8.689
12	0.278	5.501	0.357	6.315	0.449	7.227	0.558	8.244	0.685	9.374
13	0.267	5.769	0.345	6.660	0.438	7.665	0.548	8.792	0.677	10.052
14	0.257	6.026	0.334	6.994	0.428	8.092	0.539	9.331	0.670	10.721
15	0.248	6.274	0.325	7.319	0.418	8.511	0.530	9.861	0.663	11.384
16	0.240	6.514	0.316	7.635	0.410	8.920	0.522	10.383	0.656	12.040
17	0.233	6.747	0.309	7.944	0.402	9.322	0.515	10.898	0.650	12.690
18	0.226	6.973	0.301	8.245	0.394	9.716	0.508	11.405	0.644	13.334
19	0.220	7.192	0.295	8.540	0.388	10.104	0.501	11.907	0.639	13.974
20	0.214	7.407	0.288	8.828	0.381	10.485	0.495	12.402	0.634	14.608
21	0.209	7.615	0.283	9.111	0.375	10.860	0.490	12.892	0.630	15.237
22	0.204	7.819	0.277	9.388	0.370	11.230	0.484	13.376	0.625	15.862
23	0.199	8.018	0.272	9.660	0.364	11.594	0.479	13.856	0.621	16.483
24	0.195	8.213	0.267	9.928	0.359	11.954	0.475	14.331	0.617	17.100
25	0.191	8.404	0.263	10.191	0.355	12.309	0.470	14.801	0.613	17.713
26	0.187	8.591	0.259	10.449	0.350	12.659	0.466	15.267	0.609	18.323
27	0.183	8.774	0.255	10.704	0.346	13.005	0.462	15.728	0.606	18.929
28	0.180	8.954	0.251	10.955	0.342	13.347	0.458	16.186	0.603	19.531
29	0.177	9.131	0.247	11.202	0.338	13.685	0.454	16.640	0.599	20.131
30	0.174	9.305	0.244	11.446	0.335	14.020	0.450	17.091	0.596	20.727
31	0.171	9.476	0.240	11.686	0.331	14.351	0.447	17.538	0.593	21.320
32	0.168	9.644	0.237	11.924	0.328	14.679	0.444	17.981	0.590	21.911
33	0.165	9.809	0.234	12.158	0.324	15.003	0.441	18.422	0.588	22.498
34	0.163	9.972	0.231	12.389	0.321	15.324	0.437	18.859	0.585	23.084
35	0.160	10.133	0.229	12.618	0.318	15.643	0.434	19.294	0.583	23.666
36	0.158	10.291	0.226	12.844	0.315	15.958	0.432	19.725	0.580	24.246
37	0.156	10.447	0.223	13.067	0.313	16.271	0.429	20.154	0.578	24.824
38	0.154	10.601	0.221	13.288	0.310	16.581	0.426	20.580	0.575	25.399
39	0.152	10.753	0.219	13.507	0.307	16.888	0.424	21.004	0.573	25.972
40	0.150	10.902	0.216	13.723	0.305	17.193	0.421	21.425	0.571	26.543
41	0.148	11.050	0.214	13.937	0.303	17.496	0.419	21.844	0.569	27.111
42	0.146	11.196	0.212	14.149	0.300	17.796	0.416	22.260	0.567	27.678
43	0.144	11.341	0.210	14.359	0.298	18.094	0.414	22.674	0.565	28.243
44	0.143	11.484	0.208	14.567	0.296	18.390	0.412	23.086	0.563	28.805
45	0.141	11.625	0.206	14.773	0.294	18.684	0.410	23.496	0.561	29.366
46	0.139	11.764	0.204	14.977	0.292	18.975	0.408	23.903	0.559	29.925
47	0.138	11.902	0.202	15.180	0.290	19.265	0.405	24.309	0.557	30.482
48	0.136	12.038	0.201	15.380	0.288	19.552	0.403	24.712	0.555	31.037
49	0.135	12.173	0.199	15.579	0.286	19.838	0.402	25.113	0.553	31.590
50	0.134	12.307	0.197	15.776	0.284	20.122	0.400	25.513	0.552	32.142
51	0.132	12.439	0.196	15.972	0.282	20.404	0.398	25.911	0.550	32.692
52	0.131	12.570	0.194	16.166	0.280	20.684	0.396	26.307	0.548	33.241
53	0.130	12.700	0.192	16.358	0.279	20.963	0.394	26.701	0.547	33.787
54	0.128	12.828	0.191	16.549	0.277	21.239	0.392	27.094	0.545	34.333
55	0.127	12.955	0.190	16.739	0.275	21.515	0.391	27.484	0.544	34.877
56	0.126	13.081	0.188	16.927	0.274	21.788	0.389	27.873	0.542	35.419
57	0.125	13.206	0.187	17.114	0.272	22.060	0.388	28.261	0.541	35.960
58	0.124	13.330	0.185	17.299	0.271	22.331	0.386	28.647	0.539	36.499
59	0.123	13.453	0.184	17.483	0.269	22.600	0.384	29.031	0.538	37.037
60	0.122	13.574	0.183	17.666	0.268	22.868	0.383	29.414	0.537	37.574

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
Program: B. Sc Engineering (Civil)

Course Title: Structural Engineering V Course Code: CE 415 Credit: 2.00
Time : 2.00 Hours Full Marks:100 (= 20 × 5)

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

1.(a) Compute the value of live load that the beam in the following figure can carry without producing tension (flexural) at midspan section. **[08]**
Given: Effective prestress=1200 kN



Mid span section

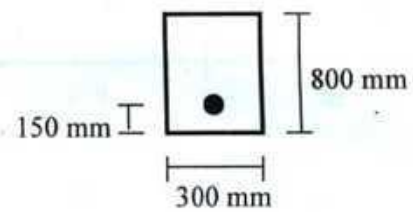
(b) Describe types and forms of prestressing steel. **[06]**

(c) Write down the different stages, advantages and disadvantages of post-tensioning system. **[06]**

2.(a) Write short notes on **[06]**
i) Creep strain of concrete ii) Shrinkage strain of concrete

(b) A concrete beam of 300 mm × 800 mm is pre-tensioned with 18-12.7 mm diameter strands(A_{ps}=1777 mm^2). Find out the losses of prestress due to creep, shrinkage and relaxation. The beam will carry an additional superimposed load of w_s=22 kN/m when prestressed at 30 days and is sustained for 3 years or more on a simply supported span of 15 m. **[14]**

Given data:
$E_s = 200\times10^3$ MPa, E_{ci}=25100 MPa, E_c=27400 MPa
f_{pu}=1860 MPa, f_i=1300 MPa.
ε_{sh}=0.0003, K_{re}= 138 , J=0.15, C=1.00

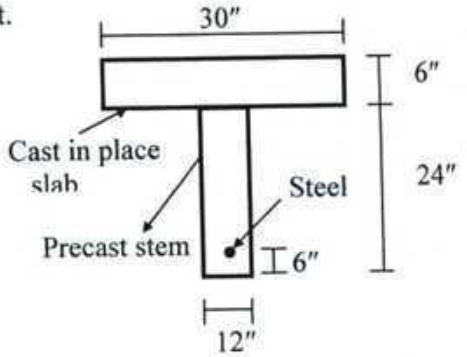


Mid span section

3.(a) Show the stress distributions in a prestressed concrete beam section for different locations of compressive force (C) according to elastic theory. **[06]**

(b) The mid-span section of a composite beam is shown in the following figure. The effective prestress is 400 kips assuming the total loss as 15%. Compute the stresses in the section at various stages if the bending moment at the section are as follows: [14]

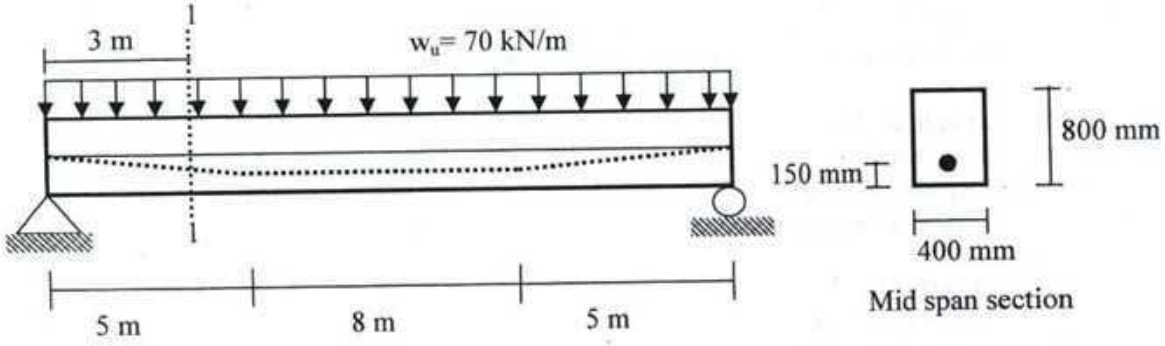
- due to weight of precast stem= 250 k-ft.
- due to top slab= 80 k-ft.
- due to live load= 400 k-ft.



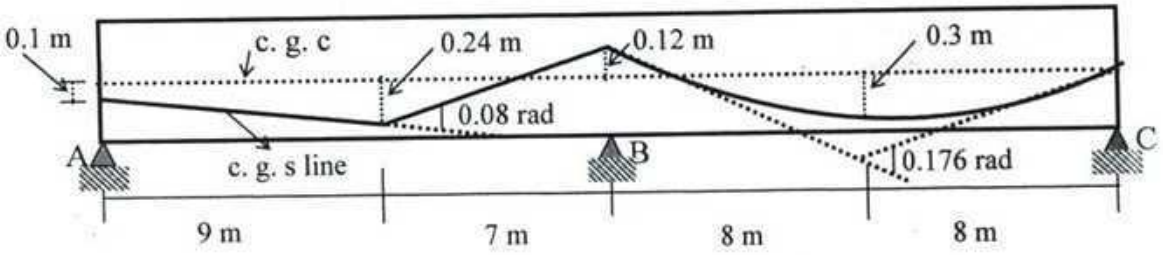
4. Design a PC beam for a simply supported span of 20 m having an overall depth of 1.2 m. The beam is to support a total load 15 kN/m including self wt. Design as T-beam and assume total loss=20%. [20
Given:
f_c'= 30 MPa, f_{pu}= 1720 MPa, f_{so}= 1035 MPa
f_b=-12.5 MPa, f_t= -11.0 MPa, f_b'=1.6 MPa, f_t'=2.1 MPa
Assume, web thickness=flange thickness=100 mm

5.(a) Describe briefly the prestress bond transfer in pretensioned concrete member. Write down the parameters which affect the transfer length for prestressing steel of pretensioned member. [05

(b) Check shear strength for the beam shown in the following figure at section 1-1 which is 3 m from support. Given that this section is adequate for w_u= 65 kN/m on the basis of its flexural strength. [15
Given: f_c'= 40 MPa, f_{so}=1200 MPa, f_{se}= 1000 MPa, A_{ps}=1760 mm^2



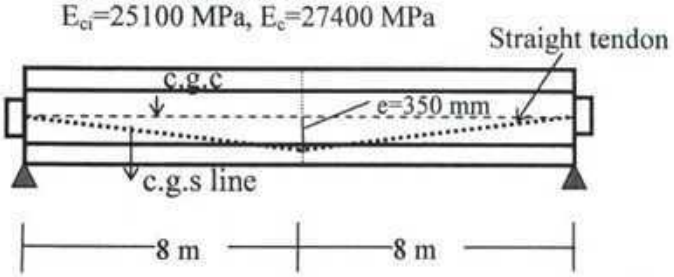
6.(a) A continuous prestressed concrete beam with bonded tendon is shown in the following figure. Locate the line of pressure (the C-line) in the concrete due to prestress alone, (without considering the dead load of the beam). Consider a prestress of 1200 kN. [1

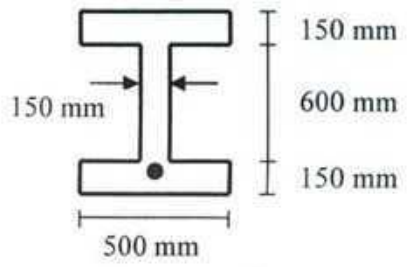


(b) Define concordancy of cable and linear transformation with sketches.

7.(a) Calculate the mid-span deflection of a 16 metre span I-beam as shown in the following figure **[10]**
(a) Immediately at transfer of prestress and (b) after 15 years.
The beam carries a superimposed dead load of 4 kN/m and service live load of 6 kN/m in addition to its self weight. It has to carry a concentrated live load of 75 kN at mid-span.
Assume that superimposed dead load are applied soon after prestress transfer.

Given: $A_{ps}=1730\ mm^2$, $A_c=240\times10^3\ mm^2$, $I=2.408\times10^{10}\ mm^4$
$f_{pi}=1300$ MPa, $f_{pe}=1120$ MPa (after 15 years)
$C_u=2.30$, $\gamma_{con}=24\ kN/m^3$
$E_{ci}=25100$ MPa, $E_c=27400$ MPa





Mid span section

(b) How can the limiting zone of c.g.s (of simply supported beam) be determined? Explain with figure. **[05]**
(c) What are the advantages of partial prestressing? Write down the methods to obtain partial prestressing. **[05]**

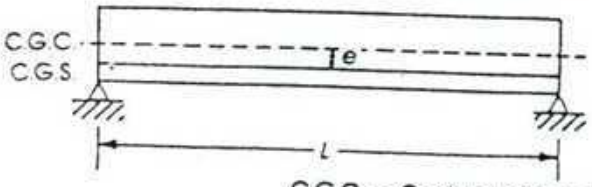
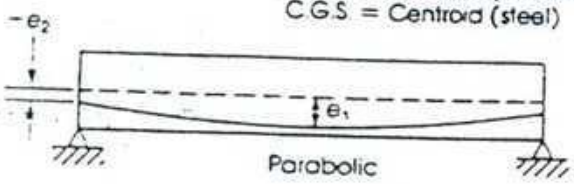
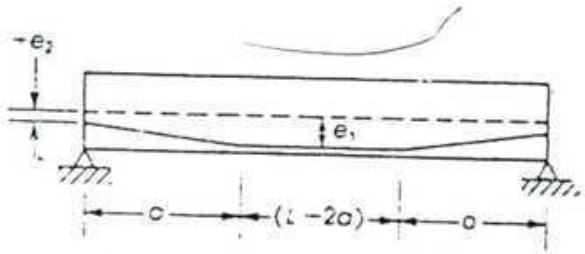
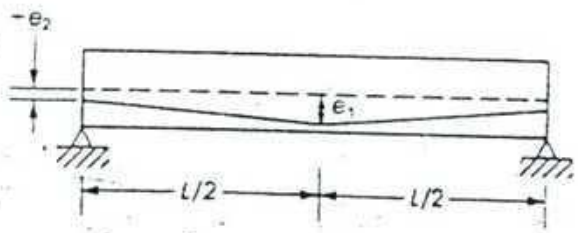
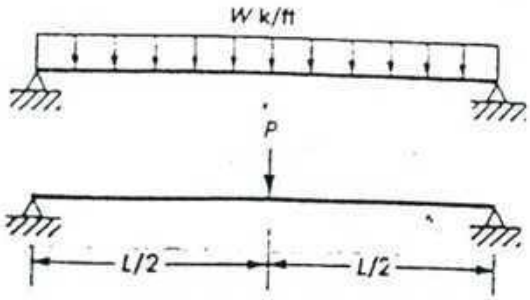
Annexure-1

Formulas

- $ES=(E_s/E_{ci})\times f_{cir}= n\times(F_o/ A + F_oe^2/I - M_ge/I)$ [$F_o= 0.9F_i$ (pretensioned member)]
- $CR=K_{cr}E_s/E_c(f_{cir} - f_{cds})$
- $RE=[K_{re}- J(SH+CR+ES)]C$
- $e= M_G/F_o +k_b$
- $e= (M_G+f_t'Ak_b)/F_o +k_b$
- $F=M_T/(e+k_t)$
- $F=(M_T-f_b'Ak_t)/(e+k_t)$
- $A_c = \dfrac{F_o h}{f_b c_t - f_t' c_b}$
- $A_c = \dfrac{Fh}{f_t c_b - f_b' c_t}$
- $A_c = \dfrac{Fh}{f_t c_b}$
- $A_c = \dfrac{F_o h}{f_b c_t}$
- $A_c = \dfrac{F_0}{f_b}(1 + \dfrac{e - (\dfrac{M_G}{F_0})}{k_t})$
- $V_{ci}=0.05\sqrt{f_c'}\, b_w d + V_d + V_i M_{cr}/M_{max} \geq 0.14\sqrt{f_c'}\, b_w d$
- $M_{cr}=[I/y_t]\times(0.5\sqrt{f_c'}+f_{pe}-f_d)$
- $V_{cw}= 0.29\sqrt{f_c'}\, b_w d +0.3f_{pc}b_w d +V_p$
- $\Delta = -\Delta_{pi} + \Delta_0$
- $\Delta = -\Delta_{pi} - \dfrac{\Delta_{pi} + \Delta_{pe}}{2} C_t + (\Delta_0 + \Delta_d)(1 + C_t) + \Delta_l$
- $C_t = \dfrac{t^{0.60}}{10 + t^{0.60}} C_u$

Annexure-2

MIDSPAN DEFLECTIONS OF SIMPLY SUPPORTED BEAMS

Schematic	*Deflection equations*
Camber due to prestressing force	
	$\Delta = \frac{(Fe)L^2}{8EI}$ (1)
C.G.C. = Centroid (concrete) C.G.S. = Centroid (steel)	(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 2008
Program: B.Sc. Engineering (Civil)

Course Title: Environmental Engineering III Course# CE 431 Credit: 2.00
Time: 2 Hours Full Marks: 100

*There are **Seven** questions Answer any **Five***
(Assume reasonable values for missing data)

1. **(a)** 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)	Dry Mass (kg)	Typical Ultimate Analysis Data (dry mass, kg)					
			C	H	O	N	S	Ash
Food Wastes	15	4.6	2.20	0.29	1.70	0.13	0.04	0.24
Paper	45	42.3	18.40	2.54	18.61	0.13	0.08	2.54
Cardboard	10	9.5	4.20	0.60	4.21	0.03	0.02	0.44
Garden Trimmings	10	4.0	1.91	0.24	1.52	0.14	0.01	0.18
Wood	5	4.0	1.90	0.24	1.70	0.10	0.00	0.06

Assuming a chemical composition of the form of $C_aH_bO_cN_d$ determine the approximate organic chemical composition (neglect sulfur and ash content) for the waste.

(b) For the solid waste sample given in the table below, estimate- **(10)**

1. Moisture content
2. Unit Energy content (Ash free dry basis).
   Assume 5.0% ash content.

Component	Percent by mass	Moisture content %	Energy kJ/kg
Food waste	20	70	69,750
Paper	25	6	753,750
Cardboard	12	5	163,000
Plastic	24	2	326,000
Garden Trimmings	5	60	65,000
Wood	10	20	93,000
Tine cane	4	3	3,500

2. **(a)** Define the following terms as per HCS and SCS **(5)**

1. Pickup time
2. Haul time
3. At-site time

2. **(b)** Solid wastes from a area are to be collected using a 4 m^3 stationary-container collection system under the following condition: **(15)**

1. Container size = $4m^3$
2. Container utilization factor = 0.75
3. Average number of container at each location = 2
4. Collection vehicle compaction ratio = 2.5
5. Container unloading time = 0.1 h/container
6. Average drive time between container location = 0.1 h
7. At-site time = 0.1 h/trip
8. One way haul distance = 30 km
9. Speed limit = 56 km/hr
10. Time from garage to first container location = 0.33 h
11. Time for last container location to garage = 0.25 h
12. Number of trip to disposal site per day = 2
13. Length of work day = 8 h

Determine the number of container that can be emptied per trip and the capacity of the collection truck.

Table: Typical value for haul constant coefficients a and b

Speed limit (km/h)	a h/trip	b h/trip
88	0.016	0.011
72	0.022	0.014
56	0.034	0.018
40	0.050	0.025

3. **(a)** Estimate the amount of gases (CH_4, CO_2 and NH_3) produced in a sanitary landfill per 150lb waste having 42% volatile organic waste on dry basis. The percent composition of the volatile organic materials are C=45%, O=50%, N=1%, H=4%. The densities of CH_4, CO_2, and NH_3 are 0.0448, 0.1235 and 0.0482 lb/ft^3 respectively at atmospheric pressure. **(8)**

(b) What are the generalized phases in the generation of landfill gases? Give brief explanation of each of the phase. **(8)**

(c) Name the factors that effects the generation rate of solid wastes. **(4)**

4. **(a)** What factors one should consider in the selection of a landfill site? **(5)**

(b) Briefly describe the most common landfilling methods. **(5)**

(c) Write down the functional elements of the activities associated with the management of solid wastes from the point of generation to final disposal. What are the factors to be considered during laying out of collection routes? **(10)**

5. **(a)** What is hazardous waste? What are the problems that have been related to the treatment and disposal of hazardous waste in developing country? **(5)**

(b) Demonstrate the advantage, disadvantage and limitation of biological treatment processes in a tabular form. **(10)**

(c) What are the options for the disposal of hazardous wastes. **(5)**

6. **(a)** What are the common hazardous substances that present in the hospital waste? **(5)**
(b) What is autoclaving? What are the standards for autoclaving in a gravity flow autoclave and in a vacuum autoclave? **(10)**
(c) Write down the steps involved in internal and external management of hospital wastes? **(5)**

7. **(a)** Briefly describe the processing, treatment and disposal methods for hospital wastes. **(10)**
(b) Classify hazardous wastes based on processing and treatment operations. **(5)**
(c) Draw a flow chart for the determination of hazardous waste. **(5)**

Formulae:

1. $H = [(t_1 + t_2) + N_d(T_{scs})]/(1 - W)$

2. $T_{scs} = P_{scs} + s + a + bx$

3. $P_{scs} = C_t uc + (n_p - 1)dbc$

4. $C_t = \frac{vr}{cf}$

6. $N_d = [(1 - W)H - (t_1 + t_2)]/(P_{hcs} + s + a + bx)$

5. $C_aH_bO_cN_d + \left(\frac{4a - b - 2c + 3d}{4}\right)H_2O \rightarrow \left(\frac{4a + b - 2c - 3d}{8}\right)CH_4 + \left(\frac{4a - b + 2c + 3d}{8}\right)CO_2 + dNH_3$

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
Program: B. Sc. Engineering (Civil)

Course No. CE 437 — Course Title: Environmental Management
Full Marks: 100 — Time: 2 Hours

There are ELEVEN questions. Question No. 1 is COMPULSORY.
Answer EIGHT additional questions from the rest.

1(a) What do you understand by "niche" and "habitat"? **12**
Draw a flow-chart showing niche interrelationships and material cycling in aquatic ecosystem. Identify primary producers, consumers and decomposers in the flow-chart.

(b) What are the main components of Environmental Management Plan (EMP) at project level. **12**
Briefly describe any three of these components.

(c) What are the major objectives of Bangladesh Environment Policy, 1992? Write down the important issues (including new issues) related to each of the following sectors: **12**
(i) Agriculture, (ii) Fisheries.

(d) Write down the steps or draw flow-chart" of actions for securing "environmental clearance" for industries belonging to "red" category. **12**

(e) What approaches/actions would you suggest for management of "water pollution" at national level? **12**

Answer any EIGHT of the following TEN questions: (8 × 5 = 40)

2. What are the major objectives of environmental management? **5**

3. Write down the major issues covered in the Environment Conservation Act 1995. **5**

4. What do you understand by "biosphere"? **5**
Why is it so important for sustenance of all living organisms?

5. Draw the grazing food-web/chain for aquatic ecosystem. **5**

6. Write down the major environmental issues to be addressed for environmental management of "Irrigation Projects". **5**

7. Write down the names/types of the Environmental Quality Standards contained in the Environment Conservation Rules 1997. **5**

8. What are the major causes of forest depletion in Bangladesh? **5**
What are the major adverse impacts of forest depletion?

9. What are the major adverse impacts of "global climate change and sea-level rise" in Bangladesh? **5**

10. What are the principal reasons behind the decline of yield in capture fisheries in Bangladesh? **5**
What are the major reasons for reduction in biodiversity in Bangladesh?

11. Give two examples each of industries belonging to "green", "orange A" and "red" categories. **5**

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
Program: B. Sc. Engineering (Civil)

Course # CE 441 — Course Title: Geotechnical Engineering II
Full Marks: 120 (20 X 6 = 120) — Time: 3 hours

Answer any 6 (six) of the following 8 (eight) questions

1. (a) Mention four purposes of geotechnical subsurface exploration. 2

(b) Write down any two general guidelines (GG) used for the selection of depth of boreholes for civil engineering projects. 2

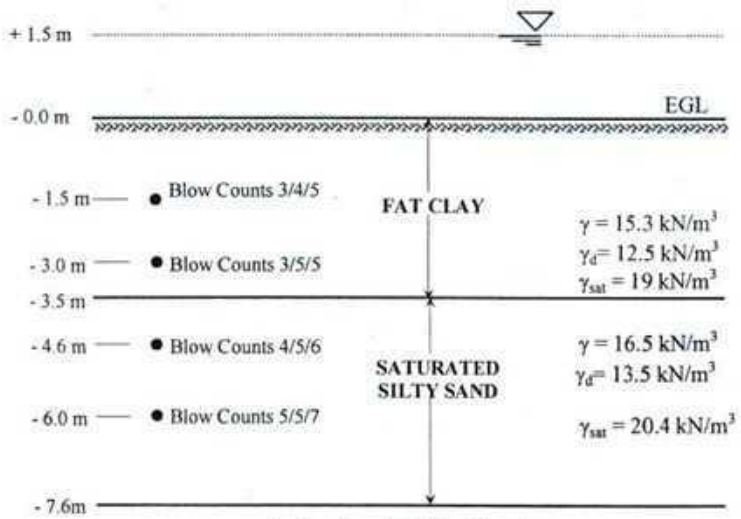
(c) Mention the name of the in-situ test most frequently used in Bangladesh. Write a short note on this test. 1 + 4 = 5

(d) The outside and inside diameters of a split-spoon sampler are 50.8 mm and 34.93 mm, respectively. The outside and inside diameters of a Shelby tube sampler are 76.2 mm and 73 mm, respectively. Estimate the degree of disturbances for two soil samples; one obtained using the split-spoon sampler and the other using the Shelby tube. Also determine whether the samples are disturbed or undisturbed. 5

(e) Write short notes (any two) on: (i) Ground water table (ii) Logging (iii) Vane shear test. 3 X 2 = 6

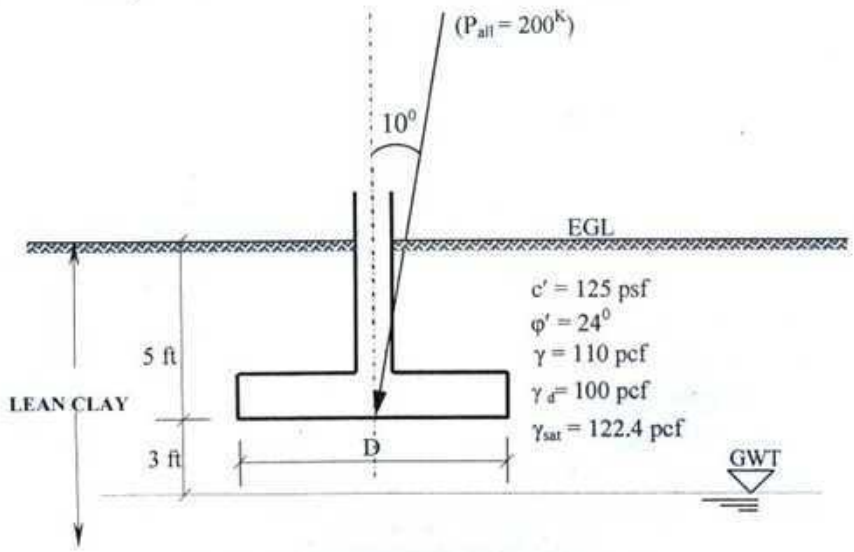
2. (a) A geotechnical site investigation was conducted at a site in Dhaka. The field blow counts and subsurface stratigraphy as obtained at the site for a particular boring are summarized in the following figure below. Determine the Field SPT values. Apply necessary corrections (for 60% energy and overburden) and calculate the corrected SPT values as required (Use Appendix A, as necessary) for the field SPT values. Also determine N_{55} and the angle of internal friction of the silty sand layer at a depth of 6 m below EGL. 8

Note: - No liner was used during the drilling operation.
- Sampling rods used in the drilling operation were all 10-foot long.



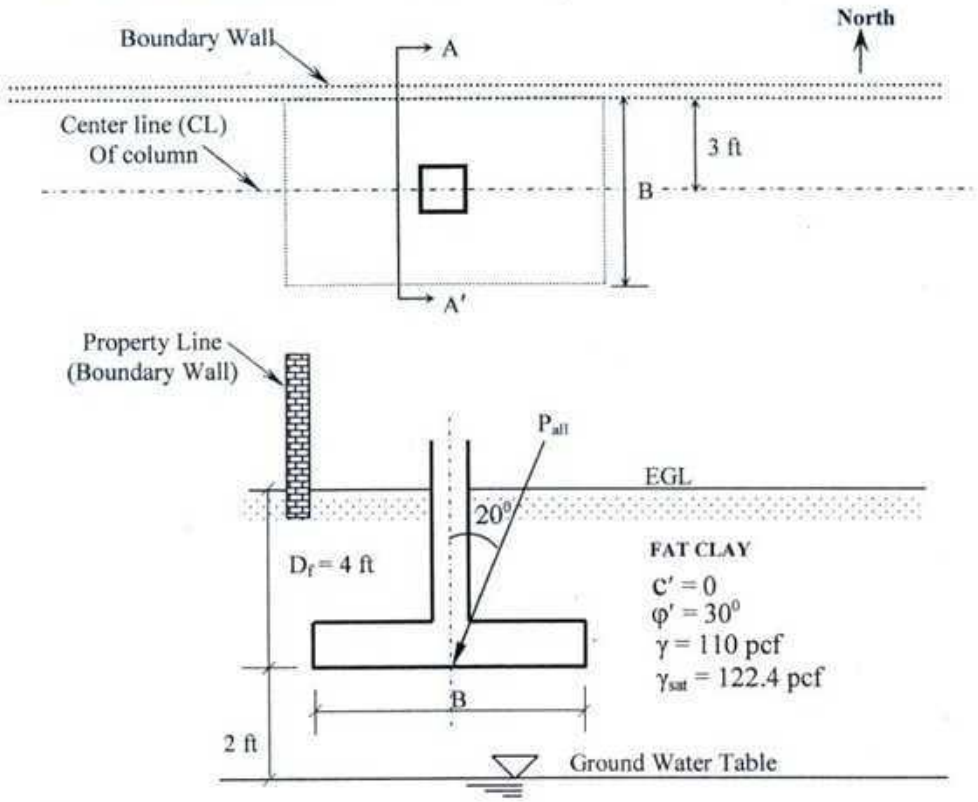
Subsurface Soil Stratigraphy

(b) A shallow circular foundation is to be constructed in sandy clay soil as shown in the following figure. Design the size of the circular footing (Use GBCE) for the allowable column load of 200 Kips (D ranges between 5 and 8 ft.). Use a factor of safety of 2.5 and assume Df/B < or = 1).



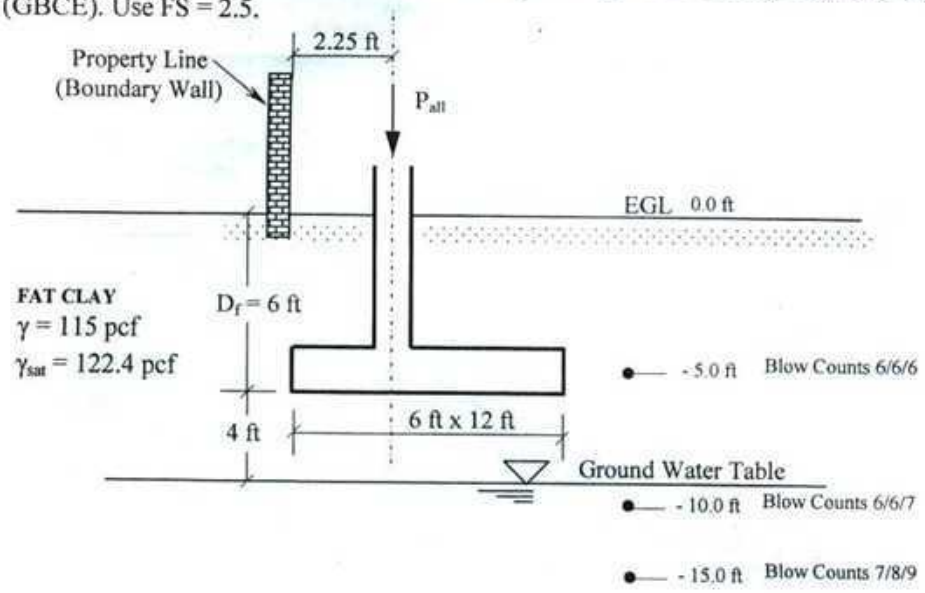
3. (a) For the following given conditions, determine the allowable column load (P_{all}) for the following footing.

- Foundation spread cannot go beyond the interior of the boundary wall
- Centerline (CL) of the column is 3 feet south of the property line
- L = 2B
- Column location cannot be moved
- Factor of safety = 2.5
- Use general bearing capacity equation (GBCE)



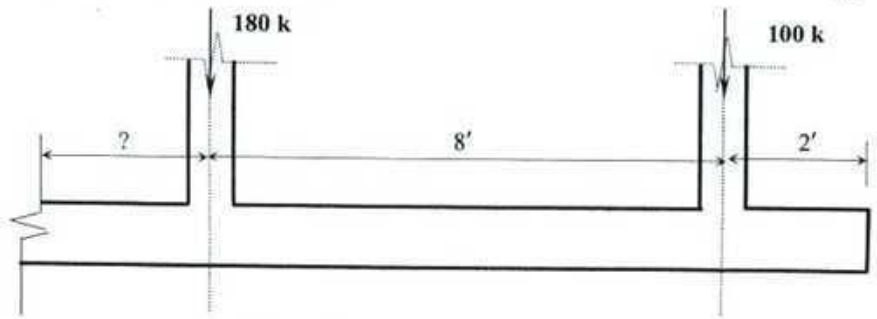
SEC A-A'

(b) An eccentrically loaded rectangular foundation (6' x 12') is shown below. Determine the allowable load that the foundation can carry. Use general bearing capacity equation (GBCE). Use FS = 2.5. 12

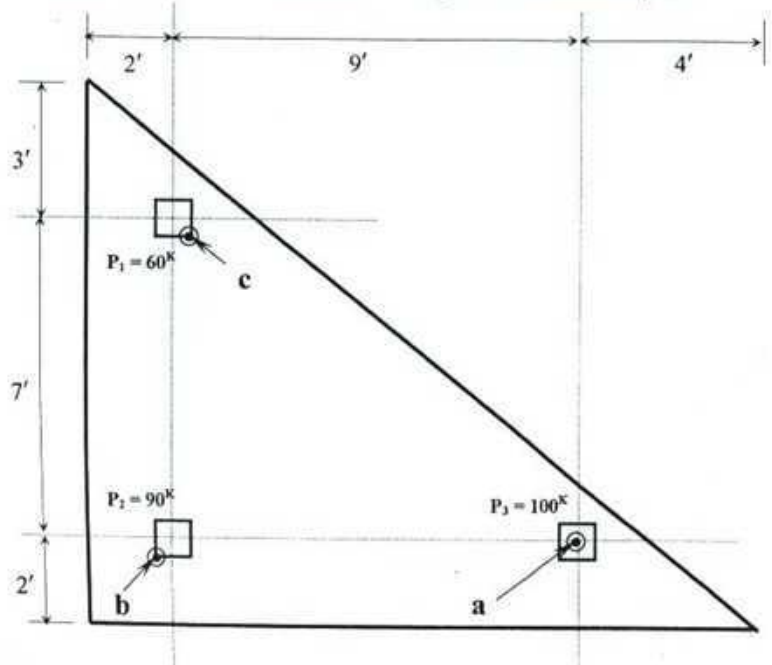


4. (a) Classify (mention names only) foundation systems generally used to support superstructures. 3.5

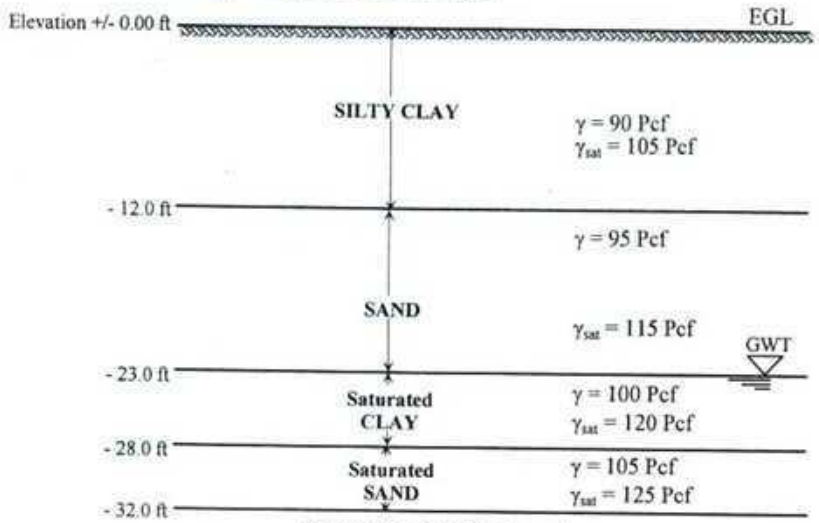
(b) Find the size of the combined foundation for the conditions shown below (q_a = 2.25 tsf). 4.5



(c) The plan of a mat foundation with column loads and dimensions is shown in the following figure. Calculate the soil pressures at points a, b and c and at the geometric centroid of the foundation (All the columns are of 12 by 12 inches in size). 12



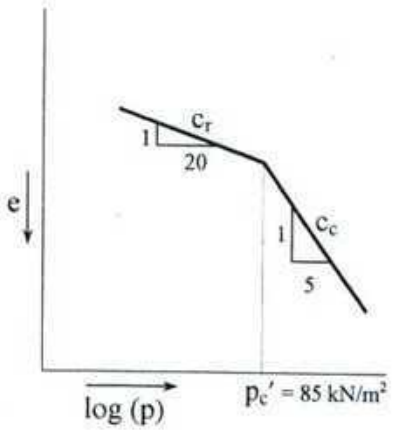
5. (a) For a fully compensated condition (floating foundation), if the depth of the mat foundation is selected to be 25 ft. below EGL, determine the number of stories that could be built. Consider uniform per floor load of 250 psf.



Subsurface Soil Stratigraphy

(b) Calculate the consolidation settlement (Use one layer & increase in average stress at the center of the clay layer) for the foundation system shown below.

Laboratory Test Results
Depth of Consolidation Test Sample = 5.5 m below EGL

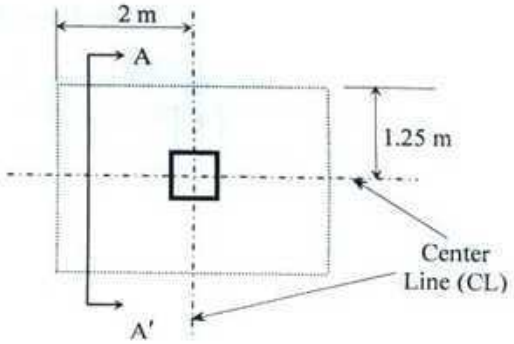


Initial moisture content (w) = 34 %
Specific Gravity (G_s) = 2.8

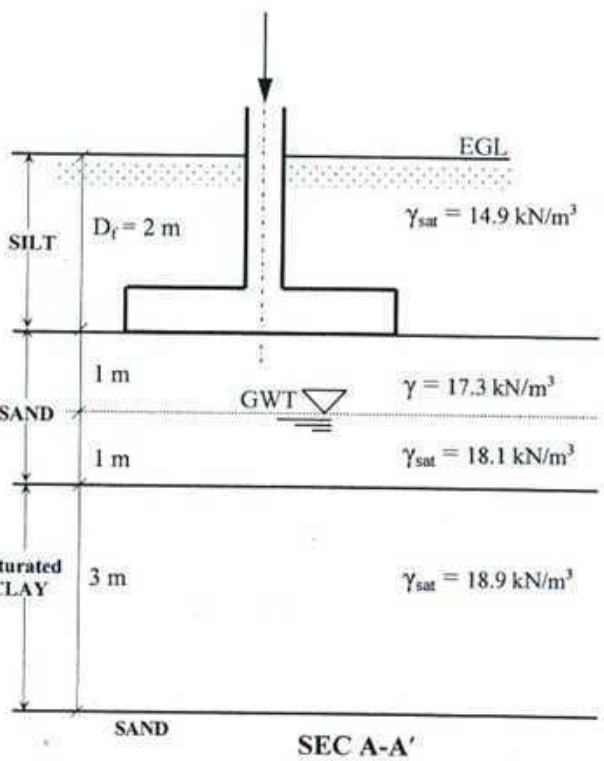
Hints:

$$e = \frac{wG_s}{S}$$

e = Void Ratio
S = Degree of Saturation



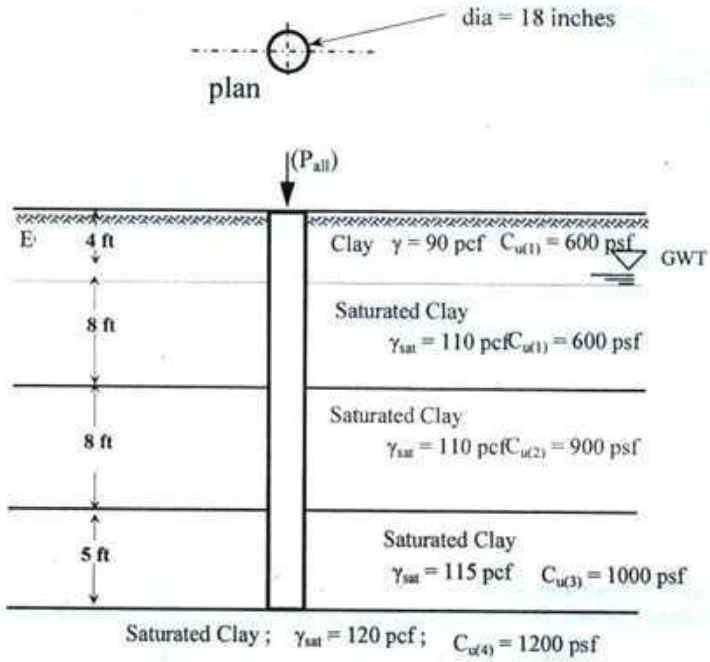
Column Load (P) = **2500** kN



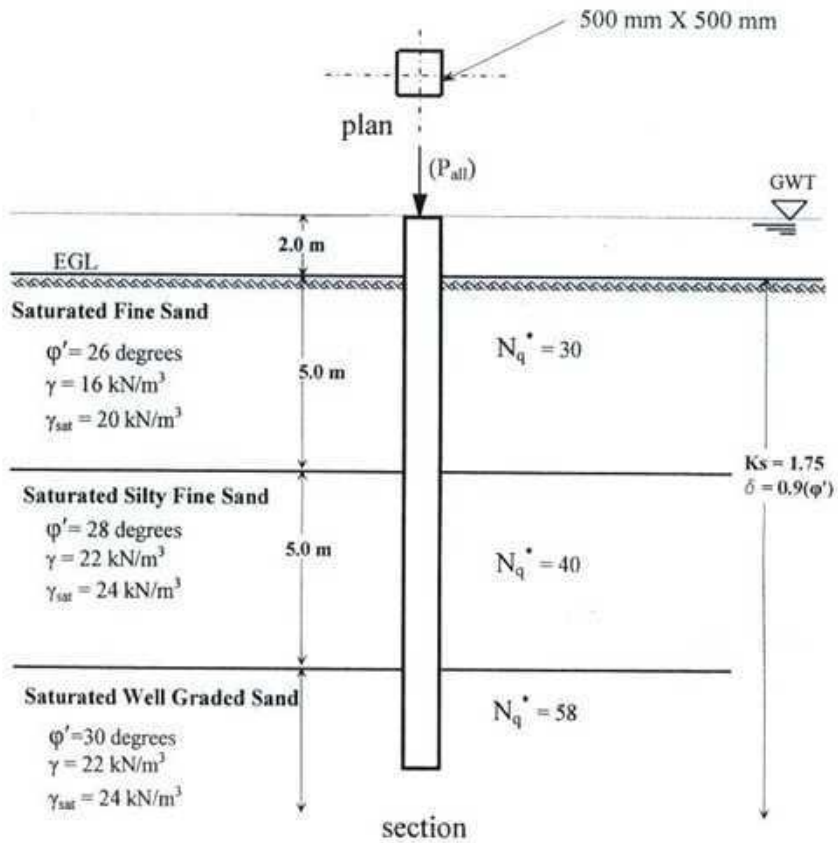
SEC A-A'

(c) Categorize (mention names only) combined footings with sketches 3

6. (a) A bored pile in clay is shown below. Calculate the allowable Capacity (P) of the pile for a factor of safety of 2.5 for both skin resistance and end bearing. 11



(b) The plan and X-section of a 15-meter long single pre-cast concrete pile (square) driven in different sand deposits are shown below. Estimate the allowable capacity of the single pile. 9



7 (a) For the soil stratigraphy and pile geometry as shown in question no. 6 (a), determine the capacity of a group of 6 piles, except the diameter of each pile is 24 inches and shear strength of each layer is reduced by 40%.

(b) Categorize (no description required) conventional retaining walls. Show sketch of a frequently used one. What are the criteria for checking the stability of a retaining wall ? Show with a sketch (no description required) the general proportioning geometry of a cantilever retaining wall.

8. (a) Classify pile foundations (mention names only) according to their materials (composition), method of installation and displacement criteria. 4

(b) Draw arrangements of group piles for the following sets of piles. 4

(i) 7 piles (ii) 10 piles

(c) Determine the factor of safety against the failure arc through the proposed slope shown below. 12

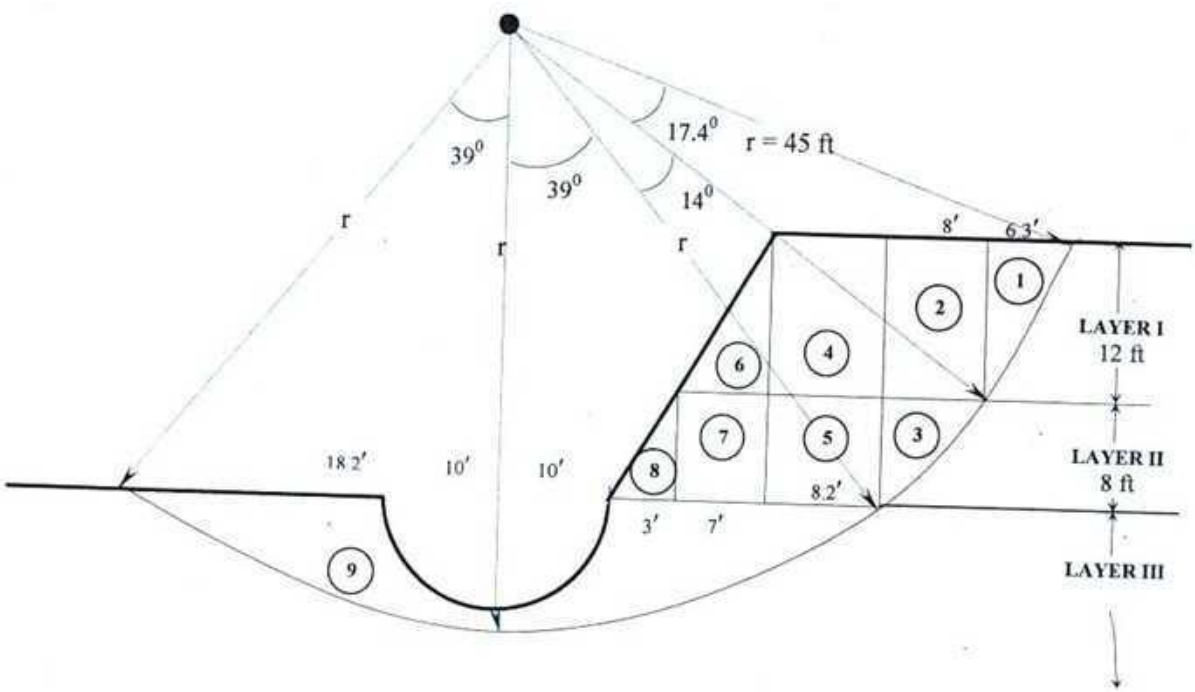
LAYER I:
Sandy Clay
Average SPT Blow Count, N = 12
Unit Weight = 115 pcf

LAYER II:
Clay
Average SPT Blow Count, N = 14
Unit Weight = 120 pcf

LAYER III:
Clay
Average SPT Blow Count, N = 16
Unit Weight = 125 pcf

Segment No.	Area (ft^2)	Arm (ft)
1	*	38.3
2	96	*
3	32	*
4	98.4	24.1
5	*	*
6	*	*
7	56	*
8	*	0
9	228	0

* To be calculated



The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall- 2008
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_08" data folder.

$6 + 3 + 4 + 4 + 3 = 20$

1. 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 four zones, namely zone 1, zone 2, zone 3, and 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
7.00 pm – 8.00 pm	1
8.00 pm – 9.00 pm	2
9.00 pm – 10.00 pm	3
10.00 pm – 11.00 pm	4
11.00 pm – 12.00 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. There are three community centres at Uttara area namely, (i) Aponjon Community Centre (ii) Istikutum Community Centre and (iii) Uttara Community Centre. The locations of the community centres are given in the map 'centres.shp'. Find out the number of holdings situated within a distance of 150 miles from each community centre.

c. The path of rail line in Dhaka city is given in the shape file line.shp. The Dhak metropolitan map is also given in dhaka_1.shp. Find out the total number of wards an ward numbers that cross the rail line.

d. The Mouza map of uttara is given in 'sec.shp' and the location of various branches o banks in the sectors is shown in banks.shp. Find out how many branches of banks are i **Abdullapur, Faidabad, Paschimkhan, Purakoir** and **Solpur** Mouza respectively

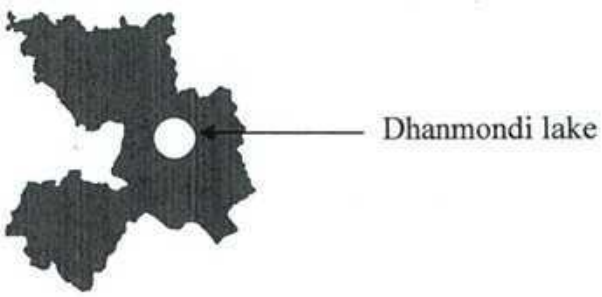
e. Dhaka metropolitan map is given in dhaka_1.shp. What is the area in square km of war nos 5, 30 and 49? What is the total area of Dhaka city?

2+2+2+7+2=1

2. Dhaka metropolitan map is given in dhaka_1.shp. There are 91 wards in Dhaka city. X is super shop which operates 168 branches in 91 wards. Location and daily sales volume (sale volume) is given in Newfield1.shp. Find,
   (a) Which ward generates highest revenue and how much?
   (b) Which ward generates lowest revenue and how much?
   (c) What is the total sum of sales volume?
   (d) Create a map based on sales volume by symbolizing sales data.
   (use color schemes as "Red monochromatic")
   (e) Prepare a layout showing the sales volume.

3+5+3+2+3=1

3. a. There are 20 thanas (add thana.shp) in Dhaka city. Create a new theme map as per th following figure and save as lake.shp.



b. Add **districts.shp** in your view. There are six airports in Bangladesh. They are situated in Dhaka, Chittagang, Sylhet, Jessore, Barisal and Rajshahi District. Create a point theme map showing the six airports and add attributes as follows:

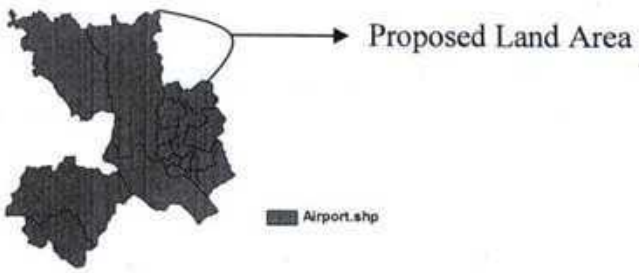
Shape	Airport	Status
Point	Dhaka	International
Point	Chittagang	International
Point	Sylhet	International
Point	Jessore	Domestic
Point	Barisal	Domestic
Point	Rajshahi	Domestic

Save the newly created point theme map as **'airport.shp'.**

c. Add **districts.shp** in your view. A highway is proposed from **Dhaka** to **Chittagang** city. Create a line theme map and save it as **highway.shp** and add attributes as follows:

Shape	Highway	Length(km)
Line	Dhaka-Chittagang	250

d. Dhaka is expanding every year (add **thana.shp** in your view) The area shown was five yeas earlier. RAJUK wants to acquire new lands to develop a model town. Create a new map with the help of existing map. The figures are shown below,



Save the newly created theme map as **'new_dhaka.shp'.**

e. Add thana__1.shp in your view. Find out the name of the upozilla whose area is greater than 80 sqkm but less than 250 sqkm.

THE UNIVERSITY OF ASIA PACIFIC
DEPARTMENT OF CIVIL ENGINEERING
Final Examination Fall 2008

Chem - 111 | Course Title: Chemistry
Full Marks: 50 | Time: 3 hours

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

Q.1. a) What is heavy water? How does it differ from ordinary water as far as their Physico-Chemical properties are concerned? (4)
b) What is meant by softening of water? Discuss two methods for softening of water. (3)
c) Define the terms BOD, COD and DO. (3)

Q.2. a) What is meant by "dry corrosion"? (2)
b) Explain dry corrosion of metals by oxygen and hydrogen both at ordinary and high temperature. (6)
c) What do you understand by the terms "pitting" and "blistering" of metals? Explain. (2)

Q.3. a) Give the main features and limitations of Rutherford's atom model. (4)
b) Derive a mathematical expression for the calculation of energy of an electron in orbits of hydrogen atom. (4)
c) State and explain Heisenberg's uncertainty principle. (2)

Q.4. a) Define and classify chemical bonds. Give a comparative picture of ionic and covalent compounds. (4)
b) Draw the molecular orbital diagram of N_2 molecule and explain the existence of the number of bonds and it's magnetic property. What is bond order? (6)

Q.5. a) Define osmosis and osmotic pressure. Why are they called colligative property? What is "reverse osmosis"? (3)
b) Deduce an expression relating the molecular weight of a solute and the osmotic pressure. (3)
c) A solution of glycol containing 1.821 g/L has an osmotic pressure of 57.8 cm of Hg at 10^0C. What is the molecular weight of glycol. (4)

Q.6. a) Define colloids and true solution. How do they differ from each other? Give some application of colloids. (3)
b) Derive the integrated rate equation for the reaction $2A \longrightarrow P$ and show that the half-life period for such a reaction is dependent on initial concentration. (4)
c) The value for the half-life period of a first order reaction is 1000 seconds. At what time one tenth (1/10) of the reactant will remain unreacted? (3)

Q.7. Write notes on the following: (4x2.5)
a) Bakelite and Melamine
b) Heat of solution and heat of neutralization
c) Electrophoresis and Electro-osmosis
d) LeChatelier's principle

The University of Asia Pacific
Department of Civil Engineering
Final Examination Fall 2008
Program: B. Sc. Engineering (Civil)

Course Title: Principles of Economics | Course Code: ECN 201 | Credit: 2.0
Time: 2 Hours | Full Marks: 50

Answer **any Five** of the following Questions (No. 1 - 7) *[Marks: 10 × 5 = 50]*

1. a) Discuss the concept of 'firm' and 'production' from the view point of theory of firm. *[4 + 6]*
   b) Describe the 'Law of diminishing marginal product' with an example.

2. a) What are the major determinants of cost of production? *[2 + 3 + 5]*
   b) What is 'marginal cost'? Discuss in light of production cost analysis.
   c) How does the concept of 'economic cost' differ from that of 'accounting cost'?

3. a) How can you understand the form of a market by examining the number of firm(s) existing in a market? *[2 + 4 +4]*
   b) What are the characteristics of a pure competitive market? What are the additional characteristics a market should possess to become perfect competitive?
   c) Distinguish between monopolistic and oligopoly market.

4. a) What are the macroeconomic objectives and tools? *[5 + 5]*
   b) Distinguish between GNP and GDP. Which one is the better measure of the national income for a developing country like Bangladesh? Why?

5. a) What are the components of aggregate demand? *[2 + 2 + 6]*
   b) How does the short-run aggregate supply curve differ from that in long-run?
   c) Describe the probable three aggregate equilibrium situations of an economy.

6. Write a short essay on 'Economics and Civil Engineering'. *[10]*

7. Write short notes on **any four** of the following issues- *[2.5 × 4]*
   a) Production function,
   b) Short run and long run,
   c) Cost concepts in economics,
   d) Monopoly,
   e) Macroeconomics,
   f) Long run aggregate supply curve and potential GDP.

The University of Asia Pacific

Department of Architecture/ Business Admin/ CE/ CSE/ EEE/ Pharmacy

Final Examination Fall-2008

Program: B Arch/ BBA/ B Sc Engineering/ B Pharm

Course Title: English Language II Course Code: HSS 103 Credit: 3 .00 (three)

Time: 3.00 Hours Full Mark: 100 (50)

1. Rewrite any ten (10) of the following sentences using appropriate modal verbs: **10**

a) There is possibility of his running the business in absence of his father.
b) We cannot but abide by all the rules of the game.
c) I was in the habit of playing football everyday when I was studying at college.
d) He is able to speak good English.
e) You are permitted to represent your brother.
f) It is suggested that he starts early.
g) I offer myself to accompany you in doing the task.
h) I am obliged to complete the assignment soon.
i) You have the necessity to study hard.
j) Kamal has no obligation to do it.
k) They did not get any permission to defend themselves by the court.
l) I advise you to make a habit of reading good books.

2. 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) He is very stupid. He can't understand anything.
b) The woman called the police. Her wallet was stolen.
c) The soup is very hot. I can't drink it.
d) I came. I was unwilling.
e) My brother was not there. My sister was not there.
f) The man is seriously injured. The man was taken to hospital.
g) I ran fast. I missed the bus
h) You say so. I must believe it.
i) Robin went out to play. Shuvo kept working.
j) I did not come. You did not call me.
k) I was younger. I thought so
l) The old man fell down the steps. He broke his leg.

3. Write one synonym and one antonym of any five (5) of the following words and make sentences with these synonyms and antonyms.

10 + 10 = 20

(10 marks for producing the synonyms & antonyms + 10 marks for making sentences)

a) Notorious
b) Immense
c) Conceal
d) Durable
e) Precise
f) Counterfeit
g) Flexible

4. Write a letter to the Head of your Department requesting his help to organize a drama club. **10**

Q6. a) Derive Euler's theorem on Homogenous function. **3**

b) If V be a function of x and y, prove that, $\frac{\partial^2 v}{\partial x^2}+\frac{\partial^2 v}{\partial y^2}=\frac{\partial^2 v}{\partial r^2}+\frac{1}{r}\frac{\partial v}{\partial r}+\frac{1}{r^2}\frac{\partial^2 v}{\partial \theta^2}$, **5**

where $x = r\cos\theta$ and $y = r\sin\theta$.

Q7. a) Define reduction formula. Obtain a reduction formula for $\int x^n e^{ax} dx$ and also find the value of $\int x e^{ax} dx$. **5**

b) Obtain a reduction formula for $\int \sec^n x dx$. **3**

Q8. Integrate any **four (04)** of the followings: **4×2 = 8**

i) $\int \frac{dx}{e^x + e^{-x}}$ ii) $\int \frac{xe^x dx}{(x+1)^2}$ iii) $\int \frac{dx}{\sqrt{x^2+x-2}}$ iv) $\int \frac{x\sin^{-1} x dx}{\sqrt{1-x^2}}$ v) $\int \sin 2x \sin 3x dx$

THE UNIVERSITY OF ASIA PACIFIC
Department of Interdepartmental Courses
Final Examination Fall-2008
Program: B.Sc. Engineering (CE)

Course Title: Math-I **Course Code: MTH-101** **Credit:3.00**
Time: 3.00 Hrs. **Full Mark: 50**

There are **Eight** questions, Answer **No. 1** and **any 05(Five):**

Q1.a) Define function. Find the domain and range of the followings:

i) $p = \sqrt{q-3}$ ii) $s = \frac{1}{2t-3}$ **1+2+2 = 5**

b) Applying $(\varepsilon.\delta)$ definition of limit, illustrate that $\lim_{x\to 2} \frac{x^2-4}{x-2} = 4$. **5**

Q2.a) If $y = a\cos(\log x) + b\sin(\log x)$ then show that, $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1) = 0$ **4**

b) By using principle rule of differentiation find the value of $\tan^{-1}x$. **4**

Q3. a) Define Beta function. Show that Beta function obeys the commutative law. **2**

b) Show that $\int_0^{\pi/2} \frac{d\varphi}{\sqrt{1-\frac{1}{2}\sin^2\varphi}} = \frac{\left(\Gamma \frac{1}{4}\right)^2}{4\sqrt{\pi}}$. **4**

c) Prove that $\Gamma n+1 = n\Gamma n$. **2**

Q4. a) Find the area of the whole of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ between the major and minor axes. **4**

b) Find the area bounded by the cardioide $r = a(1-\cos\theta)$. **4**

Q5. a) Define indeterminate form. Evaluate any **two** of the followings: **1+2+2 = 5**

i) $\lim_{x\to 0} \frac{\sin x}{x}$ ii) $\lim_{x\to\infty} \frac{x^4}{e^x}$ iii) $\lim_{x\to 1}\left(\frac{x}{x-1} - \frac{1}{\log x}\right)$

b) Find f_{xx}, f_{xy} for the following functions f(x,y): **3**
f(x,y) = xcosy + ycosx

THE UNIVERSITY OF ASIA PACIFIC
Department of Interdepartmental Courses
Final Examination Fall-2008
Program: B.Sc. Engineering (CE)

Course Title: Math-II **Course Code: MTH-103** **Credit:3.00**
Time: 3.00 Hrs. **Full Mark: 50**

There are Eight questions, Answer any 06(Six) of the following questions:

Q1. a) If (l_1,m_1,n_1) and (l_2,m_2,n_2) be the direction cosines of any two lines AB and CD and θ be the angle between them, then, $\cos\theta = l_1l_2 + m_1m_2 + n_1n_2$ **5**

b) A line makes angles $\alpha, \beta, \gamma, \delta$ with the four diagonals of a cube, prove that, **5**

$$\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = \frac{4}{3}.$$

Q2. a) Find the co-ordinates of the centre and radius of the circle $x + 2y + 2z = 15$, $x^2 + y^2 + z^2 - 2y - 4z = 11$. **5**

b) Two spheres of radii r_1 and r_2 cut orthogonally. Prove that the radius of the common circle be $\frac{r_1r_2}{\sqrt{(r_1^2 + r_2^2)}}$. **3**

Q3. a) Find the co-ordinates of the point where joining the points (2,-3,1) & (3,-4,-5) cuts the plane $3x + 4y + 5z = 5$. **3**

b) Define shortest distance. Find the shortest distance between two given lines Whose equation is given and also obtain the equation of shortest distance. **5**

Q4. a) Show that the four points (0,-1,-1), (4,5,1), (3,9,4) and (-4,4,4) lie on a plane. **2**

b) Find the equation of the plane through the intersection of the planes $x + 2y + 3z + 4 = 0$ and $4x + 3y + 2z + 1 = 0$ and the point (1, 2, 3). **3**

c) Find the angle between the planes $2x - y + z = 6$ and $x + y + 2z = 7$ **3**

Q5. a) Define unit vector. Find a unit vector parallel to the resultant of vectors $\vec{r_1} = 2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\vec{r_2} = \hat{i} + 2\hat{j} + 3\hat{k}$ **4**

b) Determine the angles α, β and γ which the vector $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ makes with the positive directions of the coordinate axes and show that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$. **4**

Q6. a) Find the projection of the vector $\vec{A} = \hat{i} - 2\hat{j} + \hat{k}$ on the vector $\vec{B} = 4\hat{i} - 4\hat{j} + 7\hat{k}$. **4**

b) If **A.B** = 0 and if **A** and **B** are not zero, then show that **A** is perpendicular to **B** and then also show that the dot product of **A & B** obeys commutative law. **4**

Q7. a) A particle moves along a curve whose parametric equations are $x = e^{-t}$, $y = 2\cos 3t$ and $z = 2\sin 3t$, where t is the time. **5**

i) Determine its velocity and acceleration at any time.

ii) Find the magnitudes of the velocity and acceleration at t = 0.

b) Show that $\bar{A}.\frac{d\bar{A}}{dt} = A\frac{dA}{dt}$ **3**

Q8. a) Find $\nabla\varphi$ if i) $\varphi = \ln|\bar{r}|$ ii) $\varphi = \frac{1}{r}$ **5**

b) If $\mathbf{A} = 3xyz^2\hat{i} + 2xy^3\hat{j} - x^2yz\hat{k}$, find div **A** at the point (1,-1,1) **3**

(c) Calculate the first four moments about the mean from the following data:

Class mark (X):	61	64	67	70	73
Frequency (f):	5	18	42	27	8

6. (a) From the data given bellow calculate Karl Pearson's coefficient of skew ness and comment on the result:

Profits (Tk. lakhs):	10-20	20-30	30-40	40-50	50-60
No. of companies:	18	20	30	22	10

(b) From the prices of shares of X and Y below, find out which is more stable in value:

X:	35	54	52	53	56	58	52	50	51	49
Y:	108	107	105	106	100	107	104	103	104	101

7. (a) One bag contains 4 white balls 2 black balls; another contains 3 white balls 5 black balls. If one ball is drawn from each bag, find the probability that (a) both are white, (b) both are black, and (c) one is white and one is black.

(b) From the following data obtain the line of regression of Y on X and estimate the value of Y when X = 8, 16 and 24.

X:	2	6	8	11	13	13	13	14
Y:	8	6	10	12	12	14	14	20

8. (a) If a variable is binomially distributed, show that its mean $\mu = Np$ and variance $\sigma^2 = Npq$. Use the above results to find the mean and standard deviation of defective bolts in a total of 400 when the probability of a defective bolt is 0.1.

(b) The breaking strengths of cables produced by manufacturer have a mean of 1800 pounds (lb) and a standard deviation of 100 lb. By a new technique in the manufacturing process, it is claimed that the breaking strength can be increased. To test this claim, a sample of 50 cables is tested and it is found that the mean breaking strength is 1850 lb. Can we support the claim at the 0.01 significance level?

The University of Asia Pacific
Department of Interdepartmental Courses
Final Examination Fall-2008
Program: B.Sc. Engineering (CE)

Course Title: MTH-III **Course Code: MTH-201** **Credit: 3.00**
Time: 3.00 Hour **Full Marks: 50**

Answer any six of the following questions:

1. (a) Write down the definition of coordinate vector with example.

   (b) If E is the standard basis of $\mathbf{R}^3$ and $S = \{u_1, u_2, u_3\}$ is another basis of $\mathbf{R}^3$ where $u_1 = (1, -1, 0)$, $u_2 = (1, 1, 0)$, $u_3 = (0, 1, 1)$ and if $v = (5, 3, 4)$, then find the coordinate vectors $[v]_E$ and $[v]_S$

2. Let $F: \mathbf{R}^2 \to \mathbf{R}^2$ the linear transformation defined by $F(x, y) = (2x + 3y, 4x - 5y)$.

(a) Find matrix representation of F relative to the basis $S = \{u_1, u_2\} = \{(1, 2), (2, 5)\}$ and also the matrix representation of F relative to the usual basis $E = \{e_1, e_2\} = \{(1, 0), (0, 1)\}$.

(b) If $v = (4, 9)$ find the coordinate vector [v] relative to the basis S and verify that

$$[F][v] = [F(v)].$$

3. Consider the following two bases of $\mathbf{R}^3$.

$$E = \{e1, e_2, e_3\} = \{(1, 0, 0), (0, 1, 0), (0, 0, 1)\}$$

and $$S = \{u_1, u_2, u_3\} = \{(1, 0, 1), (2, 1, 2), (1, 2, 2)\}$$

(a) Find the change of basis matrix P from E to S and change of basis matrix $Q = P^{-1}$ from S to E.

(b) If the vector $v = (1, 3, 5)$ then find the coordinate vector $[v]_S$ by direct calculation and also by using change of basis matrix.

4. (a) State Cayley-Hamilton theorem and verify it for the matrix $A = \begin{pmatrix} 1 & 3 \\ 4 & 5 \end{pmatrix}$ and hence find the inverse of A.

   (b) Find the eigen values, eigen vectors and eigen spaces of the following matrix

$$A = \begin{pmatrix} 4 & 1 & -1 \\ 2 & 5 & -2 \\ 1 & 1 & 2 \end{pmatrix}.$$

5. (a) The mean and standard deviation calculated from 20 observations are 15 and 10 respectively. If an additional observation 36, left out through oversight, be included in the calculations, find the correct mean and standard deviation.

(b) Establish the relation between the first four moments about the mean μ_r and the moments about an arbitrary origin μ'_r (raw moments).

THE UNIVERSITY OF ASIA PACIFIC
Department of Interdepartmental Courses
Final Examination Fall-2008
Program: Department of CE

Course Title: Math-IV **Course Code: MTH-203** **Credit:3.00**
Time: 3.00 Hrs. **Full Mark: 50**

There are **Eight** questions, Answer **any 06(Six)** of the following questions:

Q1. a) Define infinite Fourier transform, infinite Fourier sine transform, infinite Fourier cosine transform. **1+1+1= 3**

b) Establish the relation between Laplace and Fourier transform. **3**

c) Find the Fourier transform of, $f(x)= 1, \quad |x| <a$ **4**

$0, \quad |x|>a$

Q2. a) Solve the integral equation $\int_0^{\infty} f(x)\cos\lambda x dx = e^{-\lambda}$. **2.5**

b) If f(x) is even, show that, $a_n = \frac{2}{L}\int_0^{L} f(x)\cos\frac{n\pi\pi}{L}dx$. **2.5**

c) Show that, an even function can have no sine terms in its Fourier expansion. **3**

Q3. a) Find finite Fourier sine and cosine transform of $f(x) = x^2$, $0<x<4$. **5**

b) Find f(x) if its finite sine transform is given by,

$\overline{f}_s(s) = \frac{1-\cos s\pi}{s^2\pi^2}$, where $0<x<\pi$, $s = 1,2,3,\ldots\ldots\ldots\ldots$ **3**

Q4. a) If $f(n) = \frac{\cos(2n\pi/3)}{(2n+1)^2}$, then find $F_c^{-1}\{f(n)\}$, $F_s^{-1}\{f(n)\}$, if $0<x<1$. **5**

b) Show that finite sine transform of $\frac{x}{\pi}$ is $(-1)^{s+1}\frac{1}{s}$ **3**

Q5. Define inverse Laplace transform. State and prove Convolution theorem. **1+1+6 = 8**

Q6. a) Find i) $L^{-1}\left\{\frac{5s+4}{s^3}-\frac{2s-18}{s^2+9}+\frac{24-30\sqrt{s}}{s^4}\right\}$ **4**

b) Solve $Y''+9Y=\cos 2t$, if $Y(0)=1$, $Y(\pi/2)=-1$ **4**

Q7. a) Find $L\{F(t)\}$ if $F(t)=\cos(t-2\pi/3)$, $t<2\pi/3$; 0, $t>2\pi/3$ **2**

b) Prove the change of scale property. **2**

c) If $F(t)$ has period $T>0$ then $L\{F(t)\}=\frac{\int_0^T e^{-st}F(t)dt}{1-e^{-st}}$. **4**

Q8. a) Define differential equation. Obtain the differential equation of the family of the curves $y=e^x(A\cos x+B\sin x)$ **3**

b) Solve, $(y^4+4x^3y+3x)dx+(x^4+4xy^3+y+1)dy=0$ **3**

c) Find i) $L\{t^2e^{3t}\}$ ii) $L\{e^{-2t}\sin 4t\}$ **2**