

The University of Asia Pacific
Department of Civil Engineering
Fall-2010

Mid-Term Examination

Course Title: Principles of Accounting (ACN301)

Time-1 Hour

Total Marks-20

Answer all questions

(Question paper must be returned)

1. (a) Define financial accounting. Mention the steps in the financial accounting cycle. 3
 (b) What is trial balance? How a trial balance is prepared? 2
2. XYZ Consulting is a provider of taxation services. The following adjusted trial balance has been taken from the books of accounts of the consulting firm. 5

**XYZ Consulting
Trial balance
August 31, 2010**

Account titles	Debit (Tk.)	Credit (Tk.)
Cash	5,400	
Accounts Receivable	2,800	
Prepaid Insurance	2,400	
Supplies Expense	2,300	
Equipment	60,000	
Notes Payable		30,000
Accounts Payable		2,400
Capital		30,000
Drawings	1,000	
Consulting Fees		15,900
Salary Expense	3,200	
Utilities Expense	800	
Advertising Expense	400	
Total	78,300	78,300

- a) Prepare an Income Statement for the month of August, 2010.

3. Rahman started her own Consulting Firm, named Consult Rahman, on March 1, 2010. During the first month of operation the following transactions occurred. 10

Date	Transactions
Jan-1	Rahman invested Tk. 20,000 in cash in the business.
Jan-15	Purchased Office Equipment on Account Tk.3,000.
Jan-19	Rendered consulting services to the clients for cash Tk.1,500.
Jan-22	Borrowed Tk. 700 cash on a note Payable
Jan-25	Rendered consulting services to the clients on credit Tk.2,000.
Jan-28	Paid monthly salary Tk.500 by writing a cheque
Jan-30	Paid Tk. 1,000 for equipment purchased on Jan 15.
Jan-31	Rahman withdrew Tk. 200 from business for personal use

Prepare Journal, ledgers and trial balance from the above transactions

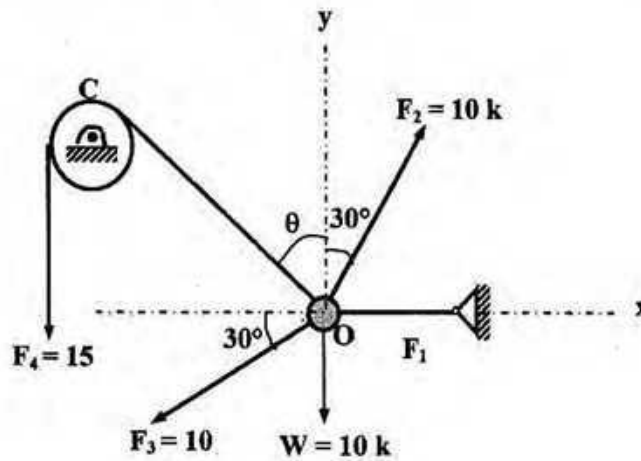
The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2010

Course # CE 101
 Full Marks: 30

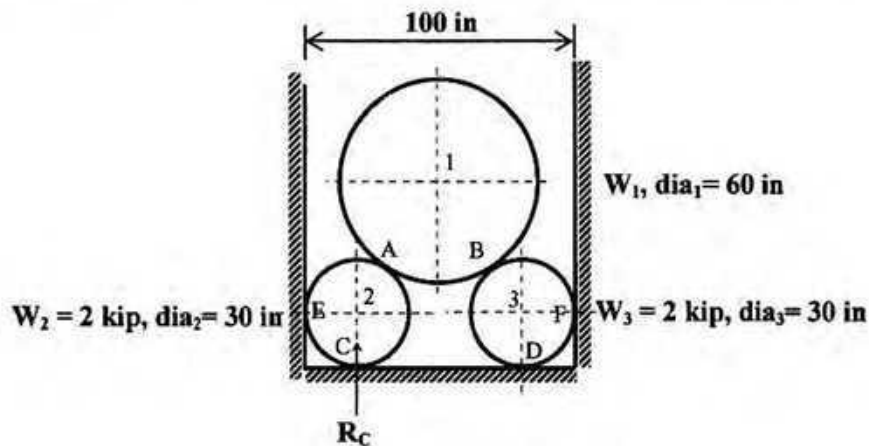
Course Title: Engineering Mechanics I
 Time: 1 hr

There are FOUR questions. Answer any THREE.
 Each question carries equal number.

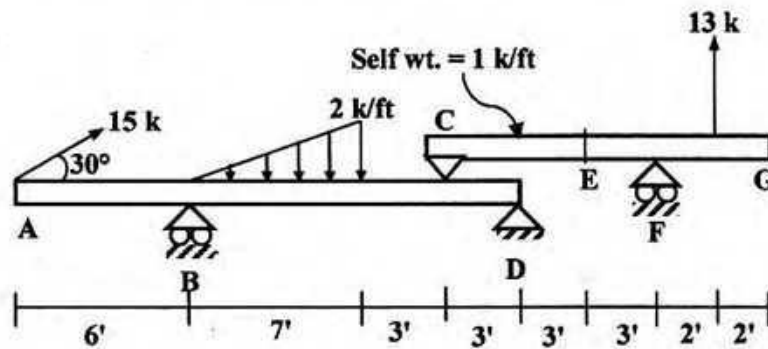
1. In the figure below, the load $W = 10$ kips is being nullified by the combined effect of F_1 , F_2 , F_3 and F_4 . Calculate the force F_1 and the angle θ , if the pulley C is smooth.



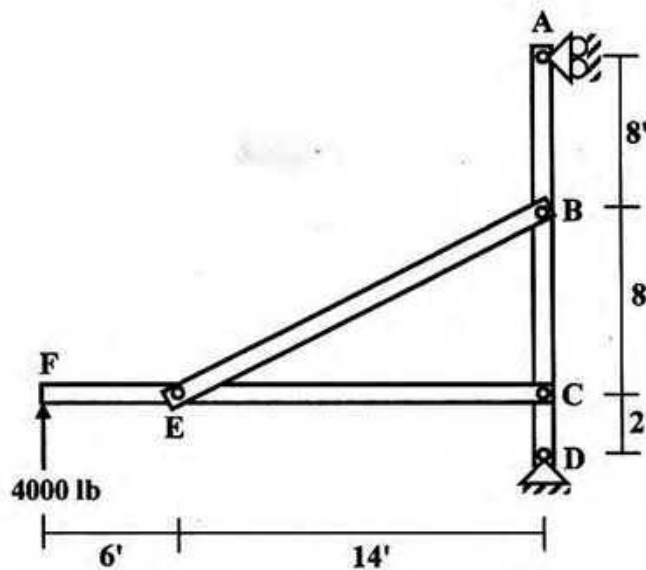
2. In the following equilibrium system, calculate the magnitude of W_1 and reaction at D. Given, reaction at C (R_C) = 4 kips.



3. For the beam loaded as shown below, calculate the reactions at supports B, D and F and also calculate the axial force, shear force and bending moment at E. Self weight of beam CG is 1 k/ft.



4. In the structure shown below, let force at F = 4000 lb & wt. of member CF = 1800 lb. Calculate reaction at support A, force in member BE and pin reaction at C.



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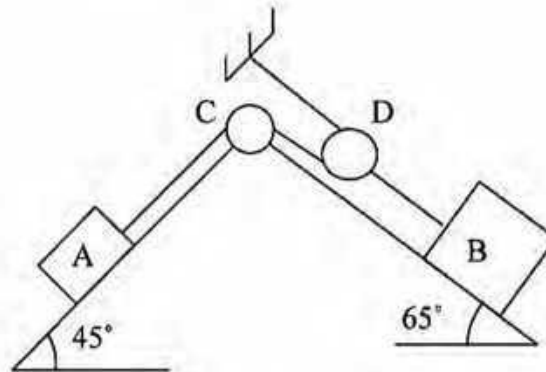
Course # CE 103
 Full Marks: 40

Course Title: Engineering Mechanics II
 Time: 1 hr.

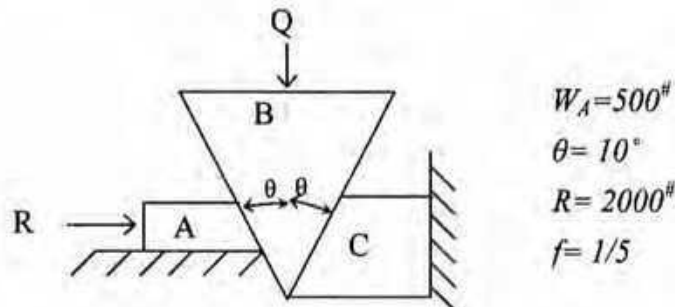
Answer any **FOUR** question out of **FIVE**. **Q.3** is **COMPULSORY** to answer.

- Q.1 If the body B is impending to move downward what is the weight of B? 10

$$\begin{aligned} W_A &= 400^{\#} \\ f_A &= 1/3 \\ f_B &= 1/4 \\ f_C &= 1/3 \\ f_D &= 1/3 \end{aligned}$$



- Q.2 A wedge B is inserted between a fixed surface C and a movable block A. If the wedge is considered weightless for what Q it will impend downward? 10



$$\begin{aligned} W_A &= 500^{\#} \\ \theta &= 10^{\circ} \\ R &= 2000^{\#} \\ f &= 1/5 \end{aligned}$$

- Q.3 Derive an expression of mass moment of inertia for a sphere about any axis going through its diameter. If the unit weight of the material is 430 #/cft. Calculate the radius of gyration about an axis 15 ft away from the centre. (Diameter of the sphere=3 ft) 10
- Q.4 The angular displacement of a rotating body is $\theta = t - 0.1 t^2$ rad. when t is in second. Calculate (i) Angular Velocity (ii) Angular Acceleration (iii) Normal Acceleration (iv) Tangential Acceleration at a point whose radius is 2 ft after 5 second. 10
- Q.5 A particle is moving with an acceleration $a = s^{1/2}$ ft/s². When it moves 16 ft what is the velocity and displacement if the time taken for such displacement is 4 second. 10

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Department of Civil Engineering
Mid-Term Examination Fall'2010

Course No: CE 105
 Full Marks: 60

Course Title: **Surveying**
 Time: 1 hour

Answer any three questions

1. (a) What is closing error? If the closing error is considerable, how can it be adjusted? (5)
 (c) Determine the values of included angles in the closed compass traverse ABCD conducted in the clockwise direction, given the following fore bearings of their respective lines: (15)

Line	Fore Bearing
AB	40°
BC	70°
CD	210°
DA	280°

2. (a) Define true bearing, magnetic bearing and arbitrary bearing? (6)
 (b) A compass close traverse ABCD was surveyed round a building site and the following readings were taken: (14)

Line	Length(ft)	Whole circle bearing
AB	1481.7	0°
BC	121.58	261°15'
CD	133.5	158°32'

Calculate length and W.C.B. of DA.

3. (a) What are the instruments used in chaining? (3)
 (b) Write short notes on: (i) Bench mark (ii) Mean sea level (3)
 (c) The following notes refer to reciprocal levels taken with one level: (14)

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

- Find (a) true R. L. of Q (b) the combined correction for curvature and refraction (c) the angular error in the collimation adjustment of the instrument

4. (a) Table below shows a Level Field Note for leveling obtained from a route surveying. Calculate the elevation of all points with check (15)

Station	B.S	I. S.	F.S.	Rise	Fall	R. L(m)	Remarks
1	2.1					60	B. M.
2		3.1					
3	1.5		2.5				T. P
4		2.5					
5			3.1				

- (b) 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. (5)

The University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2010

Course # : CE 107 Course Title: Introduction to Civil and Environmental Engg.

Full Marks:40

Time: 1 hours

1. Define / explain the following (any Four): (4x3=12)
 - a. Meteorological and hydrological drought.
 - b. Causes of flood
 - c. Age Structure
 - d. Water-logging
 - e. Hunter-gatherer society
 - f. Bio-diversity

2. Define pollution? Write four different categories of water pollution along with their sources. (5)

3. Define ecosystem and what are its components? (1+2=3)

4. Prove that the time required for population to be double is $70/r$, where r is the growth rate expressed in percentage. (2)

5. Ecosystem is an open system in regard to energy and a closed system in regard to material - explain. (2)

6. (a) Find the maximum sustainable yield if the population growth follow logistic curve. (4)

(b) what will be the rate of change in population over certain period of time for the following data when growth follows logistic curve. (5)

Growth rate = 1.7%
Population stabilizes at =15000
Present population size =5000

7. If flood water puts raw sewage into a natural flowing stream what will be the possible relationship between dissolve oxygen and biochemical oxygen demand (BOD) along the up and downstream from the point of pollution. (4)

8. Describe water resources in Bangladesh. (3)

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

Course Title : Engineering Materials
Time: One Hour

Course Code: CE 201
Full Marks: 60

Answer any **THREE** questions (3 x 20 = 60) including Question No. 1.
Question No. 1 is compulsory. The figures in the right margin indicate the marks of the questions.

1. The sieve analysis data of a sand sample for a bridge construction project are summarized below: 20

ASTM Sieve	Material Retained (g)
3 inch	0
1.5 inch	0
¾ inch	0
3/8 inch	0
#4	0
#8	70
#12	80
#16	80
#30	100
#40	10
#50	10
#100	10
#200	45
Pan	45

- (i) Calculate the FM of the sand sample,
- (ii) Draw the grading curve of the sand sample,
- (iii) Make a brief discussion on the FM, sieve analysis data, and grading curve,
- (iv) What measures are necessary to improve the grading of the sand sample?

Sieve openings: #12 - 1.7 mm, #40 - 0.425 mm, and #200 - 0.075 mm.

2. (a) What changes are necessary in the composition of cement to make cement with the following properties: 3
- (i) High early strength,
 - (ii) Moderate heat cement, and
 - (iii) Sulfate resisting cement.

- (b) Compare setting and hardening of cement. 2
- (c) Define initial setting time and final setting time of cement. Write the ASTM specifications related to the setting time of cement. 4
- (d) Compare high-grade steel bar and low-grade steel bar. Discuss the method to determine the Young's modulus of high grade steel bars 5
- (e) Explain the moisture states (different possible moisture conditions) of aggregates. 4
- (f) Compare creep and relaxation. 2
3. (a) Discuss the reasons for formation of efflorescence on brick surface. 3
- (b) How does brick get strength during burning? 3
- (c) Write short notes on the following: 3
- (i) Malleability
- (ii) Toughness
- (iii) Fatigue strength
- (d) Explain the mechanism of bulking of sand. 3
- (e) Compare bulk specific gravity and apparent specific gravity. 2
- (f) Refer to the following data associated with a sand sample: 6

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

Calculate the following:

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

4. Mixture proportion of mortar is necessary for plastering work of a brick wall of 20 ft long and 10 ft height. The following data are provided: 20

Sand to cement ratio (weight ratio) = 2.5,
 W/C=0.45,
 Specific gravity of cement = 3.0,
 Specific gravity of sand = 2.6,
 Air content = 3% ,
 Mortar thickness = 1 inch (on both surfaces of the wall).

- (i) Calculate the unit contents of sand, cement, and water,
 (ii) Calculate the unit weight of mortar,
 (iii) Estimate the amount of each ingredient (in weight and volume) of mortar necessary for the plastering work of the both surfaces of the wall. Assume 10% extra volume of material is necessary due to the loss of mortar during application on the wall. Unit weight of cement (with void) = 1350 kg/m^3 and unit weight of sand (with void) = 1300 kg/m^3 .
 (iv) What adjustment in sand volume is necessary, if bulking of sand is 20%?

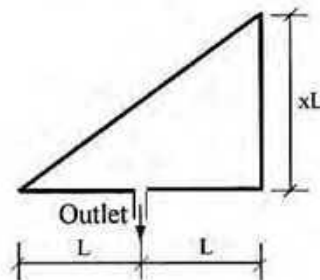
The University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2010

Course # : CE-203
 Full Marks: 60 (3 X 20 = 60)

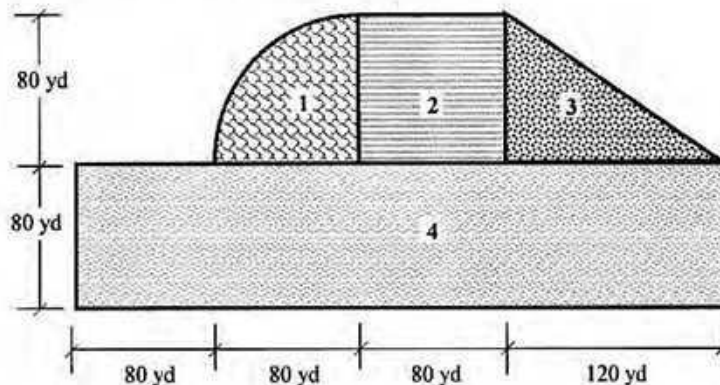
Course Title: Engineering Geology & Geomorphology
 Time: 1 hour

Answer any **three (3)** questions of your choice out of the following **four (4)**

- | | | |
|-----|---|-----|
| 1a) | Mention the principal zones of the earth from geologic point of view. Describe any one. | 7 |
| 1b) | Draw a schematic diagram of the rock cycle and provide one example of each type of rock. | 7 |
| 1c) | Classify (mention names only) geomorphic processes based on origin. Also classify (mention names only) physical and chemical weathering processes. | 6 |
| 2a) | Write short notes on flood hydrograph, axial length and time of concentration. | 7.5 |
| 2b) | Derive a relationship between FF and CC. | 2.5 |
| 2c) | In the following basin, for what value of x , the flow rate (Q) or runoff will be the maximum? Also find the FF and CC of the basin for maximum runoff. | 10 |



- | | | |
|-----|--|----|
| 3a) | Mention the factors affecting runoff. Discuss, in brief, any one of them. | 6 |
| 3b) | Write down the assumptions used in rational formula. | 4 |
| 3c) | For the drainage area as shown below, calculate peak runoff in m^3/s . Use $C_1 = 0.8$, $C_2 = 1.0$, $C_3 = 0.5$ and $C_4 = 0.7$ and $I = 0.2$ cm/min. | 10 |



- | | | |
|-----|--|---|
| 4a) | What is diastrophism? Draw a neat sketch of a typical fold geometry showing its different components. | 6 |
| 4b) | Classify folds (mention names only) based on their origin. Draw neat sketches of any two types of folds. | 6 |
| 4c) | Define fault and joint. Classify fault (mention names only) according to net slip. Draw a neat sketch of an oblique fault. | 8 |

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

Course Title: Numerical Analysis & Computer Programming
Time: 1.0 hours

Course No: CE 205
Full Marks: 40

Answer all the questions. Question 1. is compulsory to answer.

- 1.(a) (a) Correct and rewrite the program given below; (5)

```
#include<iostream>
using namespace std;

void main(
{
    int a,b;c=5;
    Cout>>"This program can multiply<<end;
    cin>>a>>b>>endl;
    C =* (a+b);
    cout<<"c"<<endl;
}
```

- (b) Write the body of a *for loop* or *do-while loop* (5)

- (c) Define any two: (5)

- (i) Header File
- (ii) Boolean Expression
- (iii) Conditional Operator

2. Using Newton Raphson method, find the real root of the following equation, (10)
$$e^{-x} = \sin x$$
up to four decimal places, $\epsilon = 0.0001$

or

- Using the iteration method, find the root of the equation (10)

$$\ln x = \frac{\sin x}{x}$$

up to four decimal places, $\epsilon = 0.0001$

3. Solve the following system of equation by Gauss Elimination Method, (15)

$$\begin{aligned} a + b + c &= 6 \\ 3a + 3b + 4c &= 20 \\ 2a + b + 3c &= 13 \end{aligned}$$

or

- Solve the following system of equation by Gauss Jordan Method, (15)

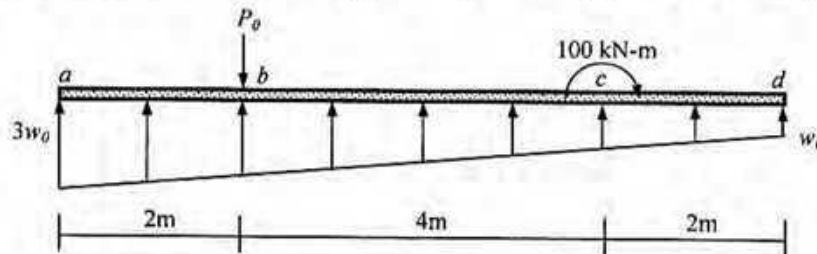
$$\begin{aligned} 5a - b - 2c &= 142 \\ a - 3b - 4c &= -30 \\ 2a - b - 3c &= 5 \end{aligned}$$

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Mid Semester Examination Fall 2010 (Set A)

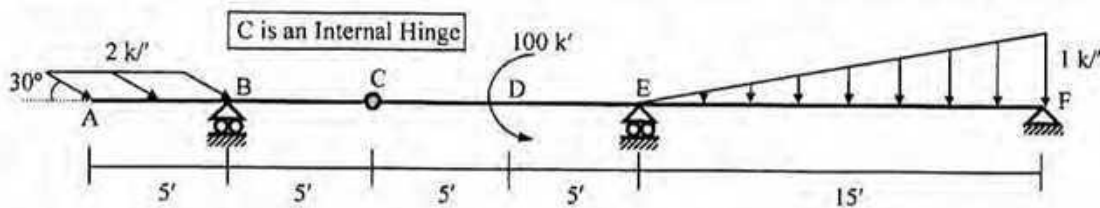
Course #: CE 211
 Full Marks: 40 (= 4 × 10)

Course Title: Mechanics of Solids I
 Time: 1 hour

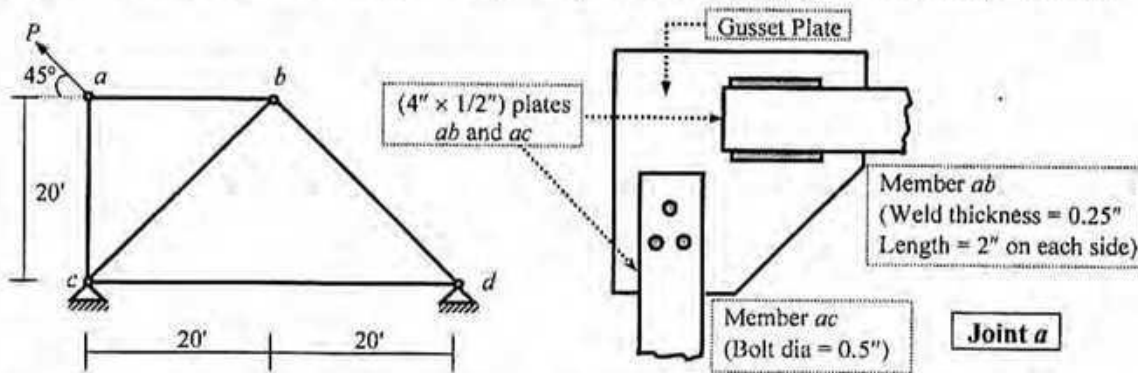
1. For the beam *abcd* shown below, use the Singularity Functions to derive the equations for shear force and bending moment, and calculate the
 (i) Shear Force just at the left and right of *b*, (ii) Bending Moment just at the left and right of *c*.



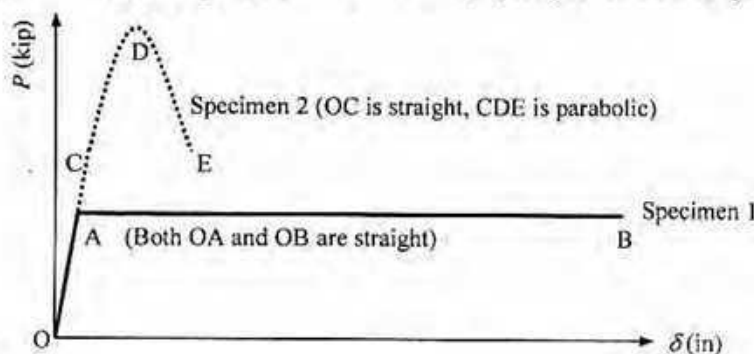
2. Draw the Axial Force, Shear Force and Bending Moment Diagrams of the beam loaded as shown below.



3. Calculate the maximum allowable force *P* that can be applied at joint *a* of the truss shown below [Given: Allowable stress in tearing = 25 ksi, bearing = 30 ksi, shearing (in bolt and weld) = 18 ksi].



4. The figure below shows the axial force (*P*) vs. elongation (δ) diagrams of two mild steel specimens (of length = 2" and diameter = 0.75") under tension. Perform necessary calculations to show which one is (i) stiffer, (ii) stronger, (iii) more resilient, (iv) tougher of the two specimens.



Specimen 1

	A	B
δ	0.003	0.32
<i>P</i>	20	20

Specimen 2

	C	D	E
δ	0.004	0.043	0.083
<i>P</i>	26	47	26

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Mid Semester Examination Fall 2010

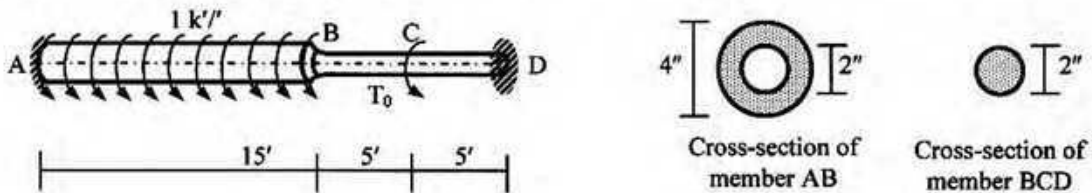
Course #: CE 213
 Full Marks: 30

Course Title: Mechanics of Solids II
 Time: 1 hr

There are **four** questions in this paper. Answer any **three**.
 (10×3=30)

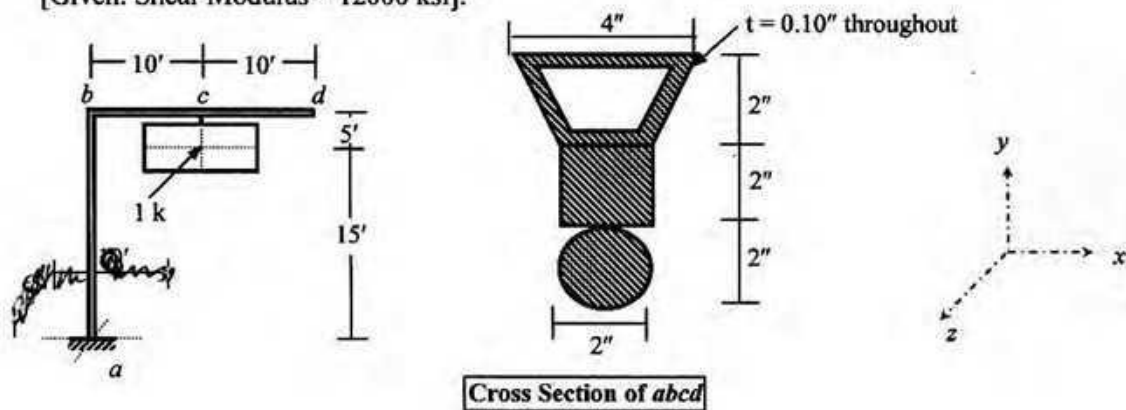
1. For the rotating shaft ABCD shown in Fig. 1

- (i) Calculate the torque T_0 required to make the torsional rotation at B equal to zero,
 - (ii) Draw the corresponding torque diagram and calculate the maximum shear stresses at A and D
- [Given: Shear Modulus = 12000 ksi].



2. For members ab and bcd of the frame $abcd$ loaded as shown in Fig. 2,

- (i) Draw the torque diagram,
 - (ii) Calculate the maximum torsional shear stress and maximum torsional rotation
- [Given: Shear Modulus = 12000 ksi].



3. Calculate the load P , if the maximum allowable compound normal stress in the member AB is 10 Ksi of the frame shown below in Figure. 3.

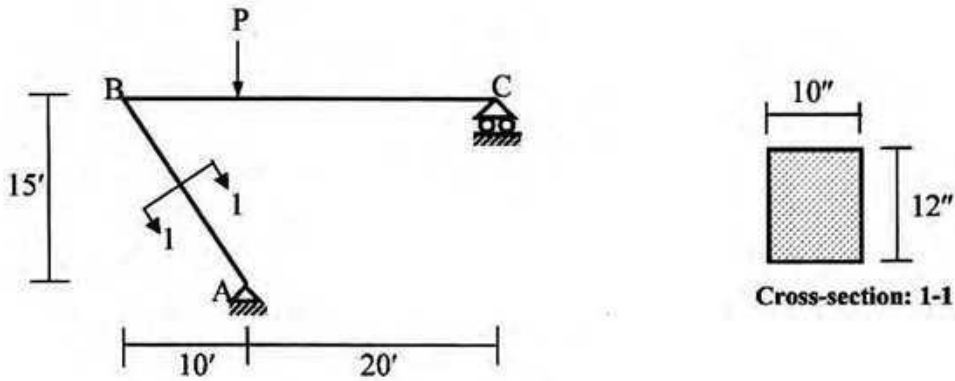


Fig. 3

4. The figure.4 below shows a rigid weightless beam ABC as shown being supported by helical spring A and B. If spring A deflects 1" due to the superimposed load w k/ft, calculate the values of

i) superimposed load ii) deflection of spring B iii) Maximum shear stress at spring B.

[Given: Stiffness of spring A and spring B are similar. Both spring have coil diameter=1", average spring diameter=5", number of coils=8 and shear modulus=12000 ksi, $\Delta = 64 PR^3N/Gd^4$]

[Hint: find the load on spring A, this load should be the reaction on beam at point A]

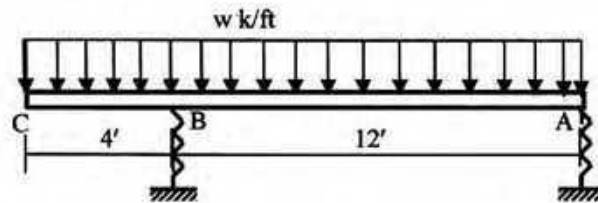


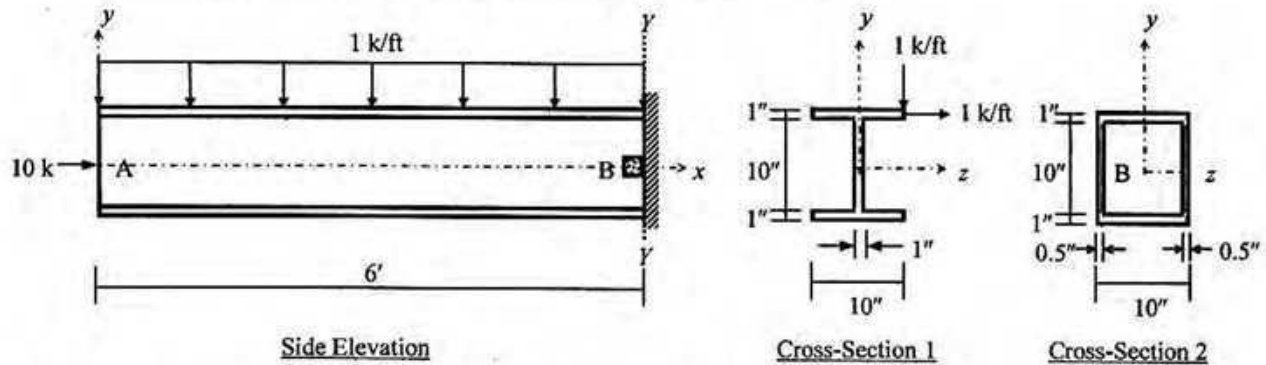
Fig. 4

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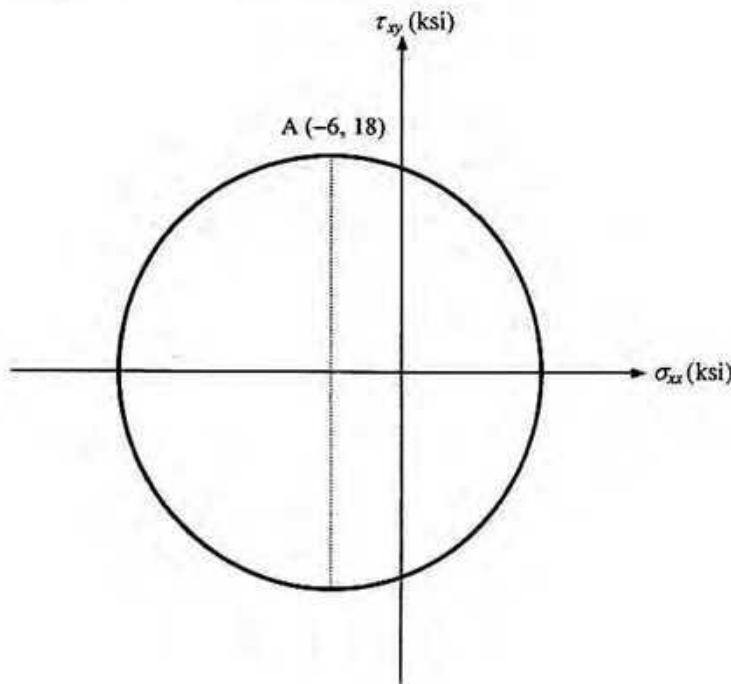
Course #: CE 213
 Full Marks: 40 (= 4 × 10)

Course Title: Mechanics of Solids II
 Time: 1 hour

1. For the member AB loaded as shown in the figure below, calculate the maximum torsional shear stress and maximum torsional rotation using
 (i) Cross-Section 1, (ii) Cross-Section 2 [Given: Shear Modulus = 12000 ksi].



2. Calculate the combined normal stress at the four corners of (i) Cross-Section 1, (ii) Cross-Section 2 for the end section Y-Y of member AB described in Question 1.
3. For the member AB described in Question 1, calculate the
 (i) normal stresses (σ_{xx} , σ_{yy}) and shear stress (τ_{xy}),
 (ii) principal stresses (σ_1 , σ_2), maximum shear stress (τ_{max}) and direction of principal planes for the point B at the end-section Y-Y (shown in Cross-Section 2).
4. Figure below shows a Mohr's circle with coordinates (-6, 18) of the point A with maximum shear stress. Use the yielding criteria suggested by (a) Rankine, (b) St. Venant, (c) Tresca, and (d) Von Mises to
 (i) Calculate the yield strength of the material required to avoid yielding [Given: Poisson's ratio of the material = 0.30],
 (ii) Draw the corresponding σ_2 vs. σ_1 diagrams.



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

Course Title: Fluid Mechanics

Course No : CE 221

Credit: 3.00

Time : 1.0 hour

Full Marks : 20

Answer all questions. The figure in the right margin indicates full marks.

5

1. Differentiate between, (i) Lagrangian Method and Eulerian Method
(ii) Uniform and Non-Uniform Flow

Or, Define (i) Surface Tension
(ii) Capillarity

3+2=5

2. a. Compute "y" in Figure 1 if the pressure differences between points A and B is 170.00 kN/m². ($P_A > P_B$)

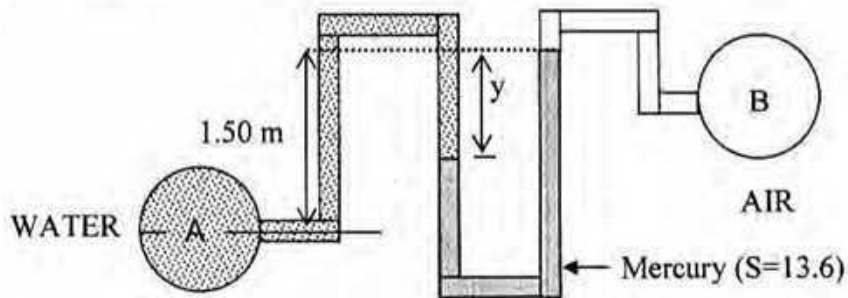


Figure 1

- b. A clean glass tube 0.025 cm diameter contains mercury at 20⁰C ($\sigma = 0.50$ N/m). What will be the capillary depression? Take angle of contact 140⁰.

3. A space of 8.0 cm between two large plane surfaces is filled with glycerin as shown in Figure 2. Determine the force (F) required to drag vertically a very thin plate 0.90 m^2 in area between the plane surfaces at a constant speed of 0.9 m/s , if the plate is at a distance of 4.25 cm from one of the surfaces. Take dynamic viscosity $0.06 \text{ N}\cdot\text{s}/\text{m}^2$ and weight of the plate 5 N .

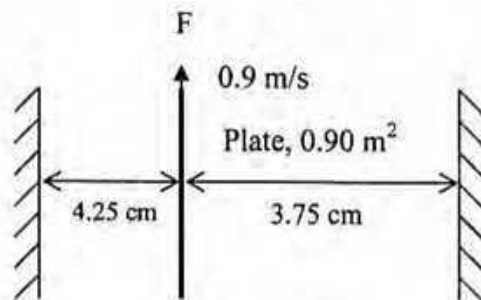
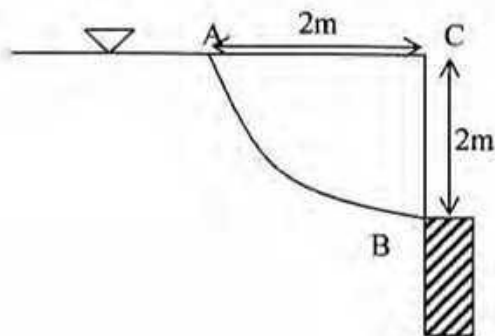


Figure 2

4. Determine and locate the horizontal and vertical component of the force due to water action on curved surface AB in the following figure. The length perpendicular to the plane of paper is 1.5 metre .



3c) Derive the following relationship:

$$\gamma_{d(\max)} = \frac{G_s \gamma_w}{(1 + e_{\min})}$$

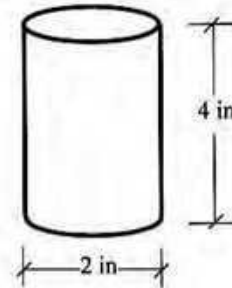
6

4a) A soil sample of clay was extracted from a site and trimmed down to a cylindrical shape as shown in the figure aside. Porosity, moisture content and specific gravity of the sample are 0.333, 16.8% and 2.7, respectively.

12

Determine:

- (i) Void ratio
- (ii) Volume occupied by soil solids
- (iii) Weight of water
- (iv) Total weight of the sample
- (v) Moist unit weight
- (vi) Dry unit weight
- (vii) Degree of saturation



4b) Laboratory test results of the following inorganic soil samples are summarized in the following table. Classify the soils (Use Attachments, flow charts Plasticity Chart as needed) according to ASTM D-2488 (Unified Soil Classification System).

Soil Sample No.	Atterberg Limits		% passing through # 200 sieve	% retained on # 200 sieve	% retained on # 4 sieve
	Liquid Limit	Plastic Limit			
1	70	20	61	---	16
2	35	18	55	17	---
3	95	35	94	---	1
4	24	20	---	15	24

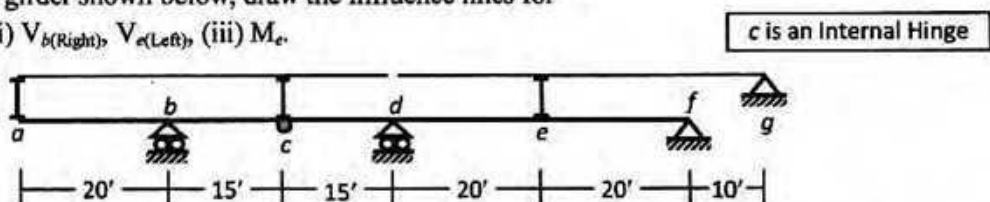
The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2010
Program: B. Sc. Engineering (Civil)

Course Title: Structural Engineering I Credit Hours: 3.0
 Time: 1 hour

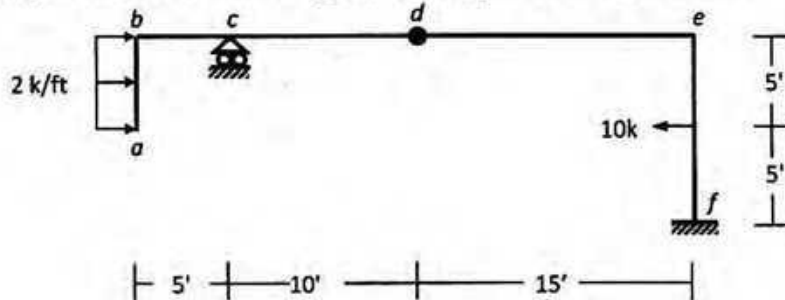
Course Code: CE 311
 Full Marks: 40 [10×4=40]

Answer all the questions.

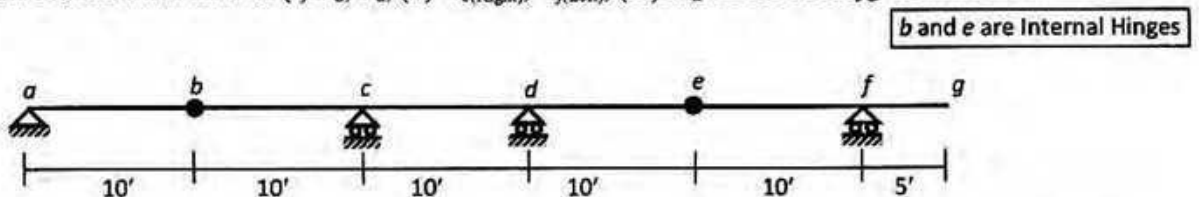
1. For the plate girder shown below, draw the influence lines for
 (i) R_b, R_f , (ii) $V_{b(Right)}, V_{c(Left)}$, (iii) M_e .



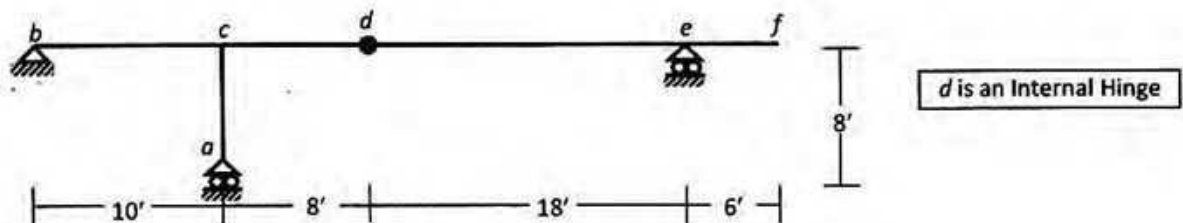
2. Determine the degree of statical indeterminacy (dosi) of the frame $abcdef$ shown below and also draw the Axial Force, Shear Force and Bending Moment diagrams of the beam $bcde$.



3. Draw the influence lines of (i) R_a, R_d , (ii) $V_{c(Right)}, V_{f(Left)}$, (iii) M_d of the $abcdefg$ shown below.



4. Determine the degree of statical indeterminacy (dosi) of the frame $abcdef$ shown below, and draw the influence lines of $Y_a, Y_b, V_{c(R)}$ and $M_{c(R/bf)}$ if the unit load moves over (i) beam bf , (ii) column ac .



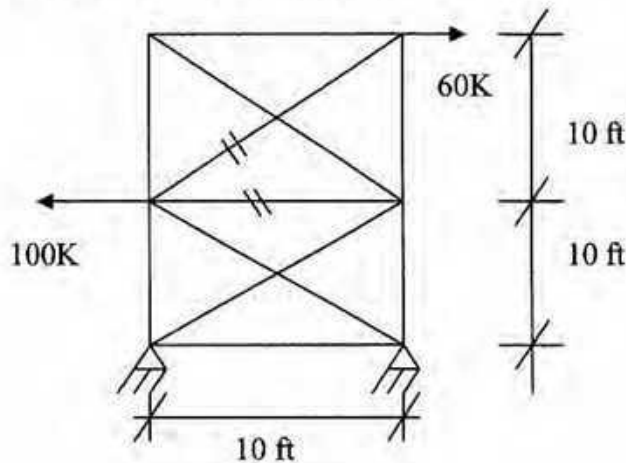
The University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Fall'2010

Course No : CE 313
 Full Marks: 60

Course Title: **Structural Analysis and Design II**
 Time: 1 hour

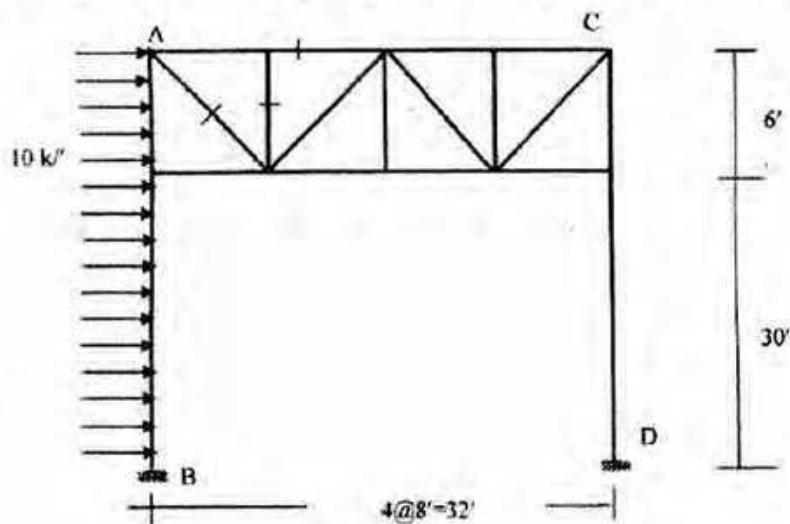
There are **FOUR** questions. Answer any **THREE**.
Total Marks: 20x3=60

1) Find the forces in the members of the truss marked by double strips. Use the assumption that diagonals can carry tension only.

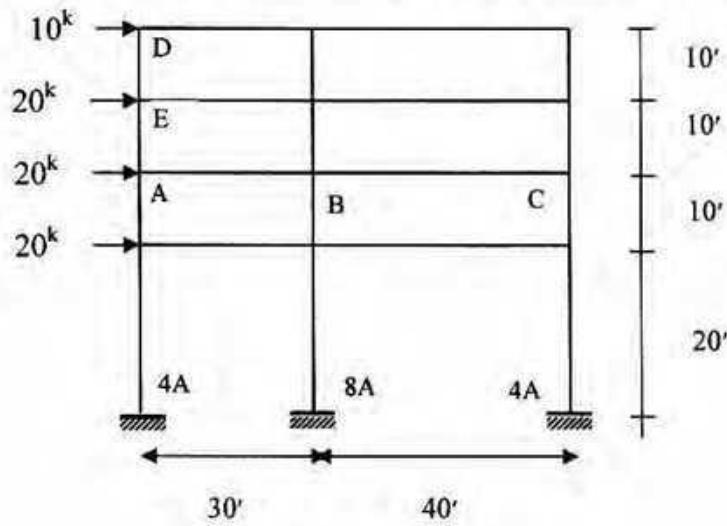


2) For the bridge portal shown in figure below

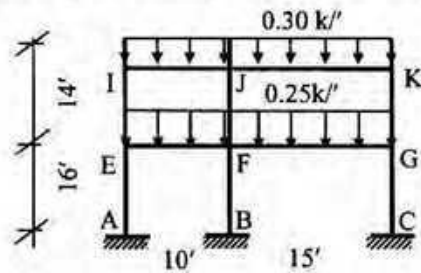
- i) Compute bar forces for the indicated members
- ii) Draw the approximate bending moment diagrams of column AB.



3. For the building frame shown below draw the bending moment and shear force diagrams for the beam ABC and column DEA using Cantilever method.



4. Draw bending moment and shear force diagram for the frame shown below. Use approximate method by making necessary assumptions.





B. Sc. Engineering Examination (Fall – 2010)
Course Number: **CE 315**; Credit hours: 3.00
Course Title: Design of Concrete Structures – I

Level – 3, Term – 1
Full Marks: 100
Time: 60 minutes

There are **FOUR** questions. Answer any **THREE** questions.

■ Question 1: (a) What is balanced steel ratio (ρ_b)? (5)

(b) Why strength reduction factor (ϕ) for column is higher than that for beam? (3)

(c) Assuming elastic cracked section, Determine the moment capacity of the beam section as shown in Figure 1. Given, $f'_c = 5000$ psi, $f_y = 50000$ psi. (25 $\frac{1}{3}$)

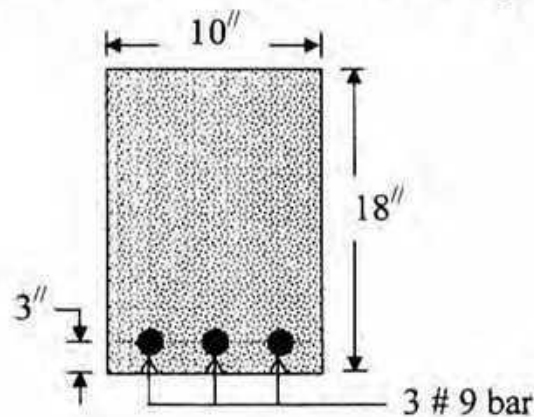


Figure 1 for Question 1(c)

■ Question 2: (a) Describe with neat sketches, behavior of RCC beams under increasing loads. (12)

(b) Determine the ultimate moment capacity (M_u) of the beam section as shown in Figure 2. Given, $f'_c = 4000$ psi, $f_y = 60000$ psi. Is it singly reinforced or doubly reinforced? (21 $\frac{1}{3}$)

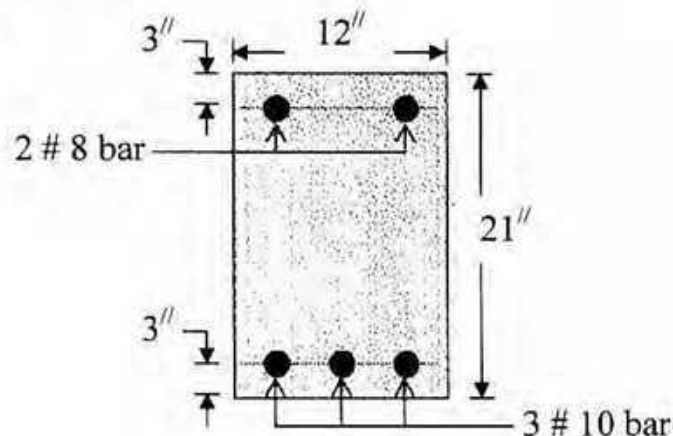


Figure 2 for Question 2(b)

■ Question 3: (a) Why load factor is different for dead load and live load? (5)

(b) Design and detail a singly reinforced beam section at mid-span with a simple span of 15 feet to support a dead load of 1.25 kip/ft (excluding self-weight) and a live load of 2.5 kip/ft (see Figure 3). Given, $f'_c = 4000$ psi, $f_y = 60000$ psi. Use ACI/USD method. (28¹/₃)

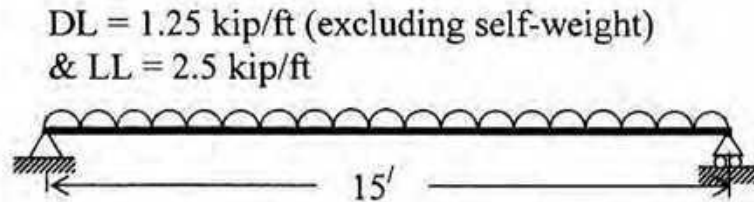


Figure 3 for Question 3(b)

■ Question 4: (a) What is cracking moment (M_{cr})? (4)

(b) A beam of size 10''x20'' is chosen due to architectural reasons to support a dead load of 1.00 kip/ft (excluding self-weight) & live load of 2.00 kip per feet on a cantilever span of 10 feet (see Figure 4). Is it singly reinforced or doubly reinforced? Design & detail the beam section at support. Given, $f'_c = 3000$ psi & $f_y = 40000$ psi. Use ACI/USD method. (29¹/₃)

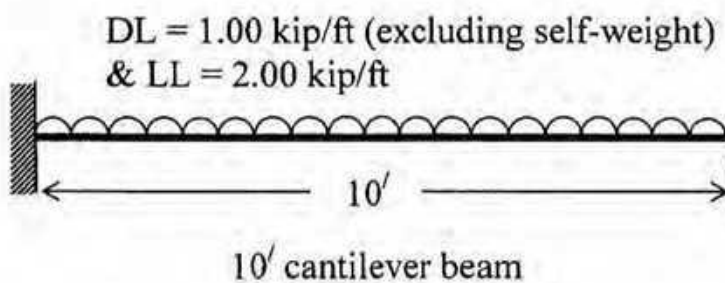
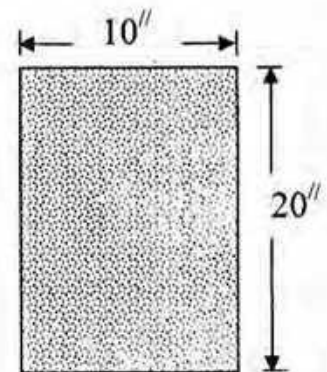


Figure 4 for Question 4(b)



beam cross-section at support

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

Course Title: Design of Concrete Structures II Credit Hours: 3.0
 Time: 1 hour

Course Code: CE 317
 Full Marks: 30 [10×3=30]

There are **FOUR** Questions. Answer any **THREE** Questions.

1. Design the slab system shown in Fig. below.

Given: $f'_c = 3$ ksi and $f_y = 40$ ksi

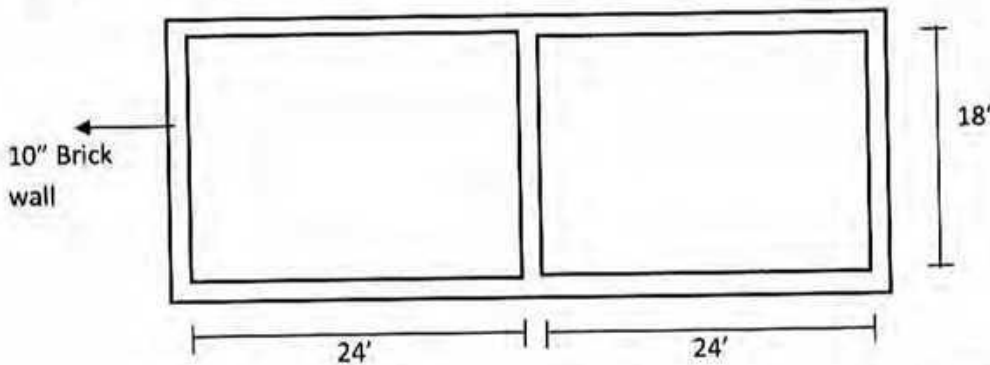
Floor Finish (FF) = 30 psf

Random wall = 40 psf

Live load = 50 psf

$f_s = 20$ ksi, $k = 0.378$, $j = 0.874$, $R = 223$ psi Use **WSD** method.

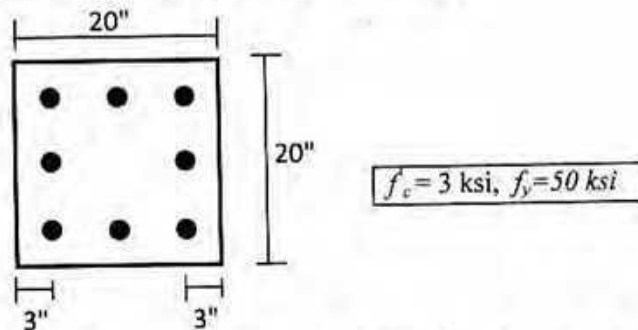
[Show all reinforcement including corner reinforcement in plan only]



2. An architect has proposed a column section 20" × 20" for a building. The calculated working loads are:

a) $P_{DL} = 300$ k, $P_{LL} = 200$ k ; no bending moment

b) $P_{DL} = 105$ k, $P_{LL} = 125$ k, $M_{DL} = 73$ k-ft, $M_{LL} = 80$ k-ft



Design the column by **USD** for case (a) and case (b). [Use the interaction diagram attached]

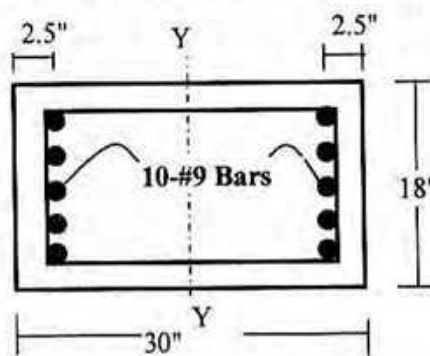
Place bars uniformly around all four faces of the column.

3. In reviewing the capability of a building, a particular column of the same existing framed building is found to be reinforced with bars as shown below. The service loads calculated for different load combinations are found as follows:

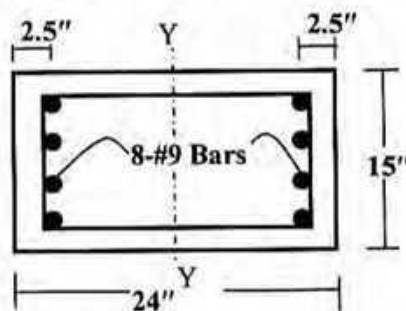
- (i) $P= 500 \text{ k}$ and $M= 150 \text{ k-ft}$
- or (iii) $P=275\text{k}$ and $M= 300 \text{ k-ft}$

Check the adequacy of the column section by **WSD** method.

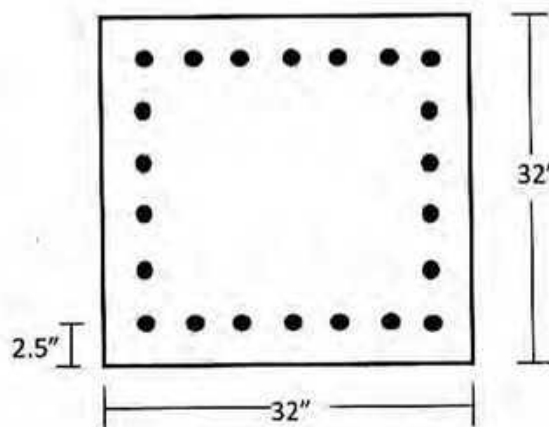
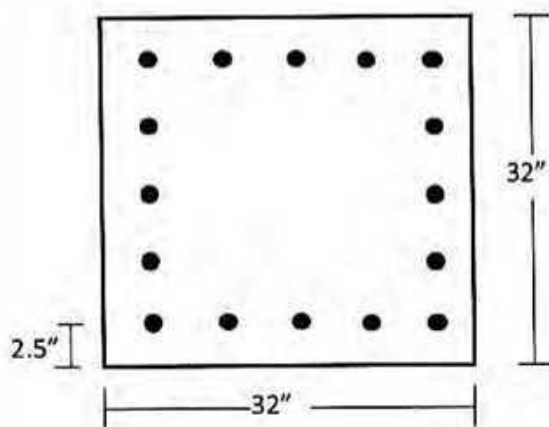
Given: $f'_c = 3 \text{ ksi}$, $f_y = 50 \text{ ksi}$, $f_s = 20 \text{ ksi}$, $S_w = 4470 \text{ in}^3$



4. (a) For the column section below, find P_n and M_n if $e=5"$ [All symbols carry their usual meaning]
 Given: $f'_c = 4 \text{ ksi}$, $f_y = 60 \text{ ksi}$, $E=29000 \text{ ksi}$



(b) Design and Draw the tie arrangements of the following column sections as per ACI Code. (all bars #8 i.e. 1" dia)



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

Course Title: Environmental Engineering I
Time: 1 Hour

Course Code: CE 331
Full Marks: 40

Answer any five out of six questions. All questions are of equal value.

1. What are the factors to be considered in planning a municipal water supply system?
2. Describe briefly the factors affecting per capita water consumption.
3. Determine the future population of a town by the geometric increase method for the year 2025 and 2040 from the following data:

Year	1960	1970	1980	1990	2000
Population	82000	95000	116000	143000	175000

Also calculate the fire demand for the population in 2025 by Freeman formula.

4. State various methods of detection and prevention of wastage of water.
5. A 30 cm diameter well penetrates 30 m below the static water table. After 24 hours of pumping at 5500 litres/minute, the water level in a test well at 80 m is lowered by 0.48 m, and in a well 40 m away, the drawdown is 1.10 m. What is the transmissibility of the aquifer?
6. Water is being brought from an impounding reservoir to the city by means of a 1st meter dia steel pipe across an undulating ground. The water level in the reservoir is 380 m where as the lowest level of the pipe in its L-section is 275 m. Determine the thickness of the pipe required with respect to the maximum pressure, if the allowance for water hammer is made for 8.5 kg/cm² over static head. The steel pipe may be taken to be riveted with efficiency of joint as 70%. The allowable working stress may be taken as 1250 kg/cm².

x

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

Course Title: Environmental Engineering I
Time: 1 Hour

Course Code: CE 331
Full Marks: 40

Answer any five out of six questions. All questions are of equal value.

1. What are the factors to be considered in planning a municipal water supply system?
2. Describe briefly the factors affecting per capita water consumption.
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Year	1960	1970	1980	1990	2000
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The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2010

Course Title: Environmental Engineering II
 Time: 1.0 hrs

Course Code: CE 333
 Full Marks: 60

There are **FOUR** questions. Answer **question 1** and any **TWO** from the rest. **QUESTION 1 is COMPULSORY.**

[Assume reasonable value for missing data (if any)]

- 1.a)** A combined area served by a sanitary sewer P₁-P₂-P₃ shown in figure 1. Residential area has a total of 50 nos. 5 storied building with two flats on each floor. The average occupancy is 5 persons per flat. Per capita water demand is 200 liter per day and per capita waste water generation rate is 70% of water use. Based on local condition and codes, average waste water flow rate for industrial area is 30 m³/ha/day and for institutional area 400 m³/day. Show the position of discharge in figure 1 and attach the page with your answer script. (15)
 Also calculate the design waste water flow for P₁, P₂, P₃ using the above information.
- b)** Write down the conditions where separate sewer system is suitable. (5)
- 2.a)** Design a two compartment septic tank to serve a household of twelve persons having the water consumption rate of 100 lpcd. The tank is to be desludged in every three years. Assume, the design temperature for sludge digestion is 25 °C and sludge accumulation rate is 0.06 m³/person/year. (10)
- b)** Write down the advantages and disadvantages of separate and combined sewerage systems. What are the suitable conditions for combined sewerage system? (10)
- 3.a)** Define the following terms: (i) Domestic sewage, (ii) Industrial wastewater, (iii) sanitary sewer, (iv) Storm sewer and (v) Sewerage. (10)
- b)** Design leach pits for both single and alternate twin off-set pit pour-flush latrines serving a family of nine members living in a peri-urban area. Consider wastewater flow rate of 8 lpcd and soil infiltration rate of 28 l/m²-day. (10)
- 4.a)** What are the general types of sanitation system? Give examples of each system (6)
- b)** Discuss different processes that take place in a septic tank. (8)
- c)** Draw a septic tank and show its different zones. (6)

Formulae:

$$V = V_h + V_d + 1.4 V_{sl}$$

$$V_{sc} = 0.4 V_{sl}$$

$$t_h = 1.5 - 0.3 \log (Pq)$$

$$V_h = 10^{-3} Pq t_h$$

$$t_d = 30 (1.035)^{35-T}$$

$$V_d = 0.5 \times 10^{-3} P t_d$$

$$V_{sl} = C \times P \times N$$

$$d_{sc} = 0.82 - 0.26A$$

Registration No.:

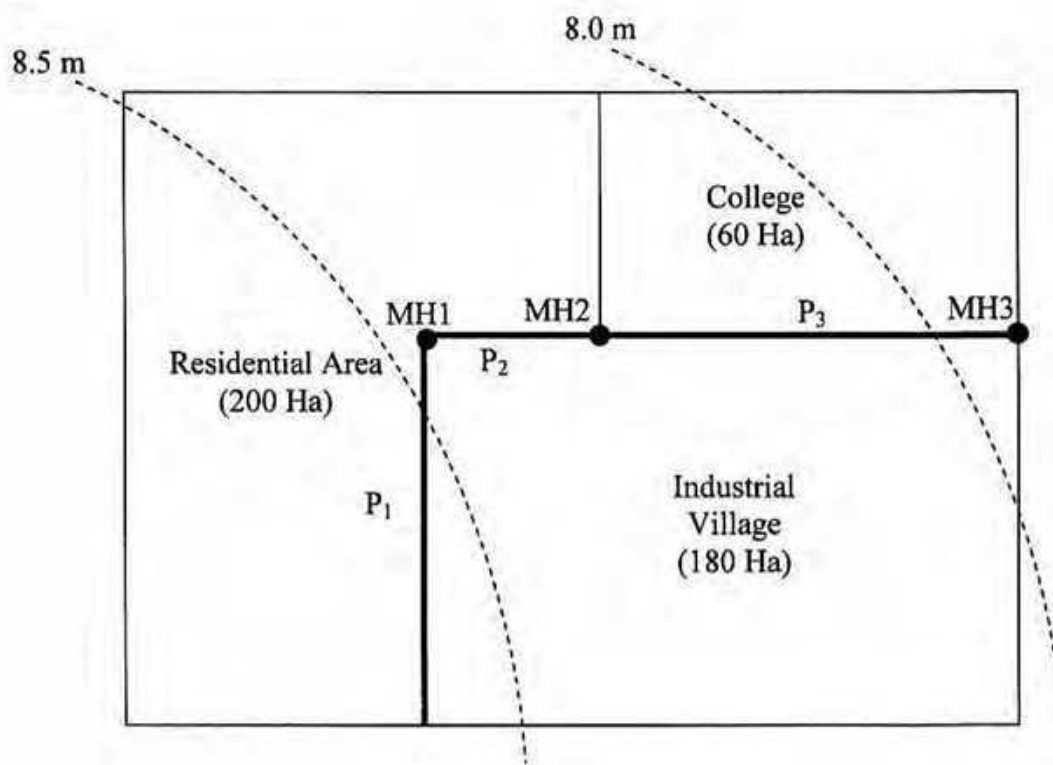


Figure 1: For question 1. a)

The University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Fall, 2010

Course # 341
 Full Marks: 60 (3 x 20 = 60)

Course Title: Geotechnical Engineering I
 Time: 1 hour

Answer any Three (3) questions:-

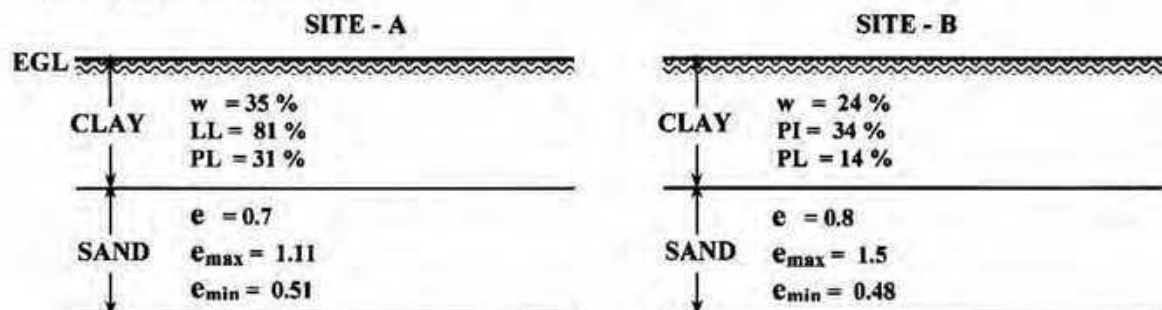
- 1a) Write a short note on soil transported and formed by combined action. 5
- 1b) Show sketches of any two types of soil structures and describe any one of them. 7
- 1c) Write short notes on cohesive and cohesionless soils. 5
- 1d) Show sketches of different shapes of coarse-grained soils. 3
- 2a) Write a short note on gradation of cohesionless soil. 6
- 2b) From the following sieve analysis data, determine the gradation of the soil with proper justification. 14

Sieve No./ Opening	Amount Retained (gm)	% Retained	Cumulative % Retained	% Finer
# 4 (4.75 mm)	0.0	0.0	0.0	100.00
# 8 (2.36 mm)	45	---	---	---
# 16 (1.18 mm)	73.1	9.75	15.75	---
# 30 (0.6 mm)	191.0	25.47	41.22	58.78
# 50 (0.3 mm)	205.2	27.36	68.58	---
# 100 (0.15 mm)	137.7	---	86.94	13.06
# 200 (0.075 mm)	65.0	8.67	---	4.39
Pan	33.0			

Total = 750 gm

--- To be calculated

- 3a) With the aid of three-phase-diagram define (any two): 6
 (i) Saturated unit weight (ii) Degree of saturation (iii) Porosity
- 3b) For two different sites (Site – A and Site – B) following information are given. Compare their shear strength characteristics.



Use the information provided below.

D_r (%)	Degree of Denseness
0 - 15	Very Loose
15 - 35	Loose
35 - 65	Medium Dense
65 - 85	Dense
85 - 100	Very Dense

I_L (%)	Consistency
< 0	Hard
0 - 20	Very Stiff
20 - 40	Stiff
40 - 60	Medium Stiff (Firm)
60 - 80	Soft
80 - 100	Very Soft

The University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Fall 2010

Course No : CE 361
Time : 1 hour

Credit Hour : 3.0
Total Marks : 20

Answer all questions. The figures in the right margin indicate full marks.

1. Define (a) Steady and Unsteady Flow (b) Uniform and Non-Uniform 2.0
2. Why the velocity distribution in open channel flows is not uniform? 2.0
3. Draw typical specific energy curve and mention its two properties. 2.0
4. A trapezoidal channel has a bottom width of 8 m and side slopes of 2 (H):1 (V). Compute the discharge and determine the state of flow in this channel if the depth of flow is 1.6 m and the mean velocity of flow is 2.50 m/s. If elementary waves are created in this channel, determine the speed of the wave fronts upstream and downstream. 6.0
5. A trapezoidal channel has a bottom width of 6.0 m, side slopes of 2:1. Calculate the alternate depth for a discharge of $8 \text{ m}^3/\text{s}$ and specific energy 2.0 m. 4.0
6. Find u, α, β from the following data: 4.0

y(mm)	0	3	10	15	20	40	50	75	85	100
u (m/s)	0	1.20	1.80	2.00	2.20	2.40	2.80	2.90	3.00	3.25

**The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2010**

Course # : CE 363

Course Title: Engineering Hydrology

Full Marks:60

Time: 1 hours

Answer all question

1. What is residence time? Assuming that all the water in the oceans is involved in the hydrological cycle, calculate the average residence time of ocean water. Use the following data. (5)

Volume of ocean water = 1 338 000 000 km³
Precipitation rate = 458 000 km³ /yr on ocean
Precipitation rate = 119 000 km³ /yr on land
Evaporation = 505 000 km³ /yr from ocean
Evaporation = 72 000 km³ /yr from land

2. Explain: (4x4=16)
- (a) method for testing the consistency of rainfall records at a station and necessary adjustment.
 - (b) how you would determine the optimum number of rain-gauges in a given basin.
 - (c) Intensity –duration-frequency relationship.
 - (d) Advantages of recording rain gauge over non recording rain gauge.

3. For a drainage basin of 9.14 km², isohyets drawn for a storm gave the following data: (10)

Isohyets interval (mm)	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
Inter-isohyetal area (km ²)	0.88	1.59	2.24	3.01	1.22	0.2

Estimate the average depth of precipitation over the catchment.

4. Define : (a) Front (b) Lapse rate (c) Vapor pressure (d) Ideal gas law (e) Hydrostatic pressure law (10)
5. List different factors affect the evaporation from a water body. (6)
6. Why pan coefficient need to be introduced to correct the evaporation data observed from evaporimeters. (3)

7. Estimate the average daily evaporation from a lake using the following data

(5)

Reservoir area = 250 ha

Average temp. for the week = 20°C

Relative humidity = 40 %

Wind velocity 1.0 m above ground = 16 km/h

8. Sketch the free body diagram for the following:

(a) Water budget in a water body

(b) Energy balance in a water body

(5)

Mid Term examination

Answer all questions
Time: 1 hrs

Marks : 50

Exam date : 18 December, 2010

Write your ID:

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Write your Name: _____

Read before answer

- A. Answer all the questions and marks are mentioned in the margin
- B. Use Pencil or Pen (except red ink)
- C. For all types of calculation use the answer script only
- D. For all calculation take up to two decimal places
- E. Any form of unfair means is strictly prohibited

1. Which of the following statement is true (1)
 - a. If you find a feasible region for a linear programming problem, then optimal solution may be multiple
 - b. If you find a feasible region for a linear programming problem, the there must be a single optimal solution only.
 - c. If you find a feasible region for a linear programming problem, the there will be no optimal solution.
 - d. None of the above
2. Which of the following statement is true (1)
 - a. Line of redundant constraint may pass through the feasible region
 - b. Line of redundant constraint must pass through the feasible region
 - c. Line of redundant constraint must pass outside the feasible region
 - d. None of the above
3. Which of the following statement is true (1)
 - a. If IRR is less than the discount rate NPV must be positive
 - b. IRR is the discount rate which equates the present value of cash flows with the initial investment.
 - c. If IRR is greater than the discount rate NPV must be negative
 - d. None of the above
4. Which of the following statement is true (1)
 - a. Discounting pay back period is more realistic
 - b. Non-discounting pay back period is more realistic
 - c. Both Non-discounting and Discounting pay back period are equally realistic
 - d. None of the above
5. Which of the following statement is true (1)
 - a. Status report in project management is done in definition stage
 - b. Status report in project management is done in planning stage
 - c. Status report in project management is done in execution stage
 - d. Status report in project management is done in delivery stage
6. Activity Predecessor Duration (1)

A	----	2
B	-----	3
C	A, B	4
D	C	5

 - a. A and C is on critical path
 - b. B, and C is on critical path
 - c. A and D is on critical path
 - d. None of the above

(Project Planning and Management)

7. Which of the following statement is false (1)
- a. Project is a temporary endeavor undertaken to accomplish a specific goal
 - b. Project is an one time activity with a well-defined set of desired end results
 - c. Project is a complex, non-routine, one-time effort limited by time, budget, resources and performance specifications designed to meet customer need."
 - d. None of the above
8. Which of the following is not a major characteristic of a project (1)
- a. Multifunctional
 - b. Interdependency
 - c. Independence
 - d. Conflict
9. Which of the following statement is true (1)
- a. Level of effort in a project is highest at planning stage
 - b. Level of effort in a project is highest at delivery stage
 - c. Level of effort in a project is highest at execution stage
 - d. Level of effort in a project is highest at definition stage
10. Which of the following statement is true (1)
- a. If IRR is less than the discount rate NPV must be positive
 - b. IRR is the discount rate which equates the present value of cash flows with the initial investment.
 - c. If IRR is greater than the discount rate NPV must be negative
 - d. None of the above
11. Which of the following statement is true (1)
- a. Discount rate should logically be the Bank's deposit interest rate
 - b. Discount rate should logically be the Money devaluation considering all aspects
 - c. Both (a) and (b)
 - d. None of the above
12. P, Q and R are the three activities of a project but these three activities are not predecessor for any other activities. If the duration of P, Q and R is 5, 6, 7 and the start time of P, Q and R is 20, 18, 16 then the duration of the project is (1)
- a. 20
 - b. 25
 - c. 23
 - d. 24
13. Activity Predecessor Duration (1)
- | | | |
|---|------|---|
| A | ---- | 2 |
| B | A | 3 |
| C | ---- | 4 |
| D | B,C | 6 |
- The start time of the activity D is
- a. 3
 - b. 5
 - c. 6
 - d. 4
14. Activity Predecessor Duration (1)
- | | | |
|---|------|---|
| A | ---- | 2 |
| B | ---- | 3 |
| C | A, B | 4 |
| D | C | 5 |
- a. A and C is on critical path
 - b. B, and C is on critical path
 - c. A and D is on critical path
 - d. None of the above

(Project Planning and Management)

15. The Farmer's American Bank of Leesburg is planning to install a new computerized accounts system. Bank management has determined the activities required to complete the project, the precedence relationships of the activities are as follows: (13)

Activity	Description	Activity Successor	Time (Weeks)
A	Position recruiting	B, C	4
B	System development	D, E	3
C	System training	F, G	2
D	Equipment training	H	5
E	Manual system test	H, G	1
F	Preliminary system changeover	G	3
G	Computer-personal interface	I	4
H	Equipment - modification	I	4
I	Equipment testing	---	6

- Draw the AON network diagram
- Find the project completion time
- Find the critical path

OR

The Farmer's American Bank of Leesburg is planning to install a new computerized accounts system. Bank management has determined the activities required to complete the project, the precedence relationships of the activities are as follows:

Activity	Description	Activity Successor	Time (Weeks)
A	Position recruiting	B, C	21
B	System development	D	5
C	System training	E, F	7
D	Equipment training	E, F	2
E	Manual system test	G	5
F	Preliminary system changeover	G	8
G	Computer-personal interface	---	2

- Draw the AON network diagram
- Find the project completion time
- Find the critical path

16. Cash flow of a project A has shown below

(10)

Year	Cash flow of Project A
0	1000000
1	500000
2	400000
3	300000
4	200000
5	100000

- Find the discounted pay back period considering the discount rate of 10%.

or

Cash flow of a project A has shown below

Year	Cash flow of Project A
0	1000000
1	650000
2	550000
3	200000
4	300000
5	50000

- Find the NPV, BCR for the project considering the discount rate of 10%.
- Write the equation to find the value of IRR for the project (no need to calculate the value)

17. Objective function:

$$\text{Maximize } Z = 2x_1 + 3x_2$$

[13]

Constrains:

$$x_1 + x_2 \leq 30$$

$$x_2 \geq 3$$

$$x_2 \leq 12$$

$$x_1 - x_2 \geq 0$$

$$x_1 \geq 0$$

$$x_1 \leq 20$$

- Find the feasible region for the above condition
- Find the optimum value of X_1 and X_2 by graphical method.
- Find maximum profit

or

Objective function:

$$\text{Maximize } Z = x_1 + 0.5x_2$$

Constrains:

$$3x_1 + 2x_2 \leq 12$$

$$5x_1 \leq 10$$

$$x_1 + x_2 \leq 8$$

$$-x_1 + x_2 \geq 4$$

$$x_1, x_2 \geq 0$$

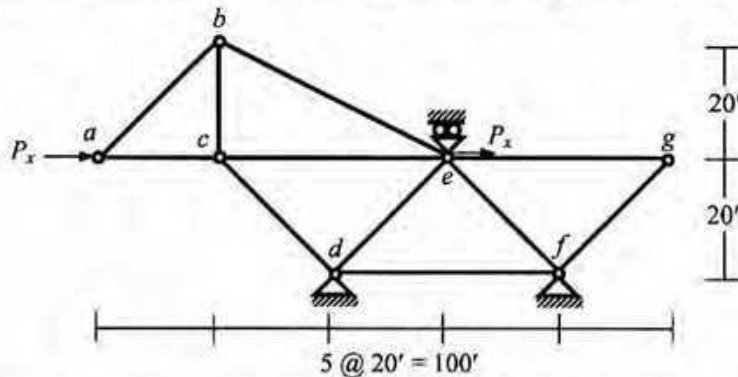
- Find the feasible area by Graphical Method
- Find the optimum value of X_1 and X_2 .
- Find maximum profit

The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2010 (Set A)

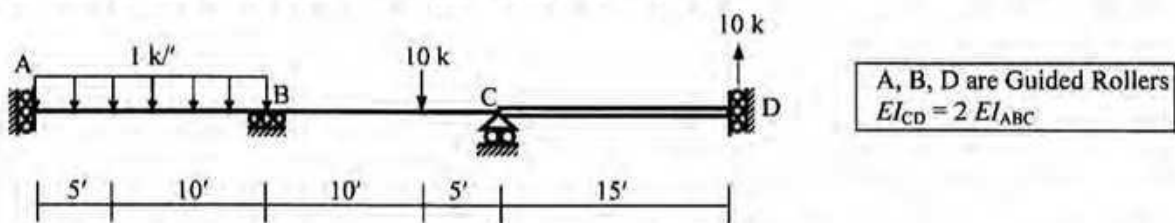
Course #: CE 411
 Full Marks: 40 (= 4 × 10)

Course Title: Structural Engineering III
 Time: 1 hour

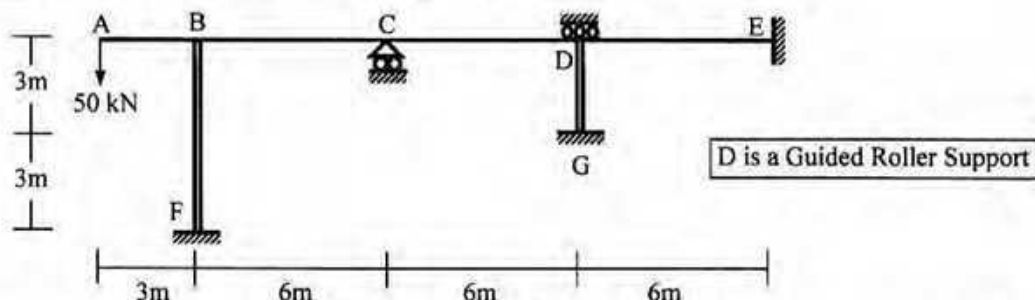
1. Calculate the member forces of truss *abcdefg* shown below if the joint *e* moves 0.10' to the right, and also settles 0.10' downward. Also calculate the applied forces P_x [Given: $S_x = \text{constant} = 500 \text{ kip/ft}$].



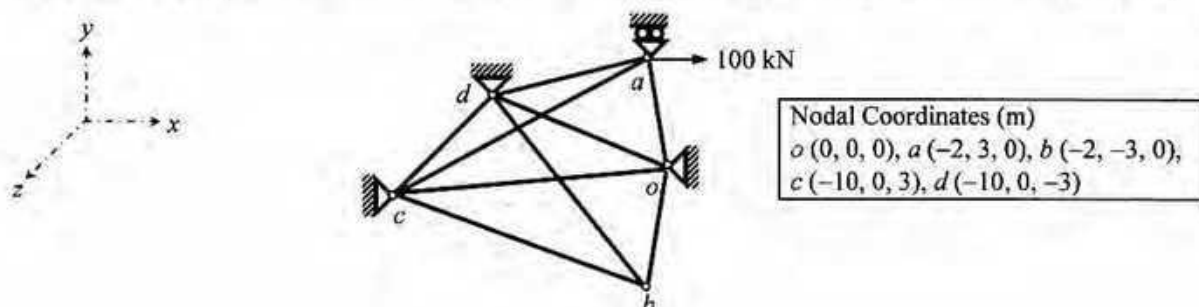
2. Determine the size of the stiffness matrix (considering boundary conditions also) of the beam shown below. Also determine the size of its stiffness matrix if axial deformations are neglected. Use the Stiffness Method (neglecting axial deformations) to calculate the joint rotations and deflections of the beam loaded as shown below [Given: $EI_{ABC} = 40,000 \text{ k-ft}^2$].



3. Determine the size of the stiffness matrix (considering boundary conditions also) of the frame shown below. Also determine the size of its stiffness matrix if axial deformations are neglected. Use the Stiffness Method (considering flexural deformations only) to calculate all the joint deflections and rotations, if in addition to the applied load, support C settles 0.03 m [Given: $EI_{ABCD} = 20 \times 10^3 \text{ kN-m}^2$, $EI_{BF, DG} = 40 \times 10^3 \text{ kN-m}^2$].



4. Use the Stiffness Method (ignoring zero-force members) to assemble the stiffness matrix, load vector and calculate the joint deflections of truss *oabcd* shown below [Given: $S_x = \text{constant} = 5000 \text{ kN/m}$].



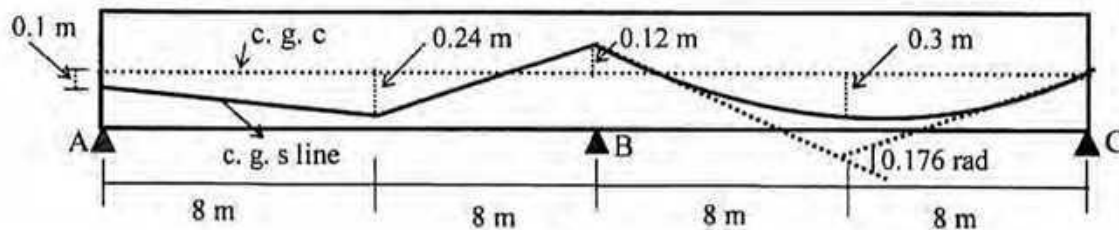
The University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2010
Program: B. Sc Engineering (Civil)

Course Title: Structural Engineering V Course Code: CE 415
 Time: 1.00 Hour

Credit: 2.00
 Full Marks: 40

Answer any 2 (two) questions

1. (a) Calculate the % loss of prestress in the beam shown below due to friction for tensioning is done from one end. Solve this problem using more exact expression. Given $K=0.0026/m$, $\mu=0.3$
 [Formula: $F_2 = F_1 e^{-(KL + \mu\alpha)}$] [10]



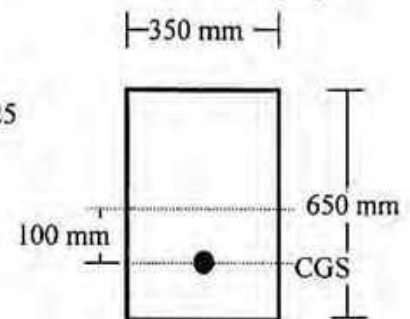
(b) Discuss the basic difference between the behavior of Prestressed and reinforced concrete beam section in resisting external moment with necessary figures [05]

(c) Discuss the variation of steel stress in bonded and unbonded member under various stages of loading. Explain with sketches. [05]

2.a) A concrete beam of dimension $350 \text{ mm} \times 650 \text{ mm}$ is pre-tensioned with 18-12.7 mm diameter strands ($A_{ps}=1777 \text{ mm}^2$). Find out the losses of prestress due to elasting shortening, creep, shrinkage and relaxation. The beam will carry additional superimposed load $w_s = 10 \text{ kN/m}$ when erected at 30 days and is sustained for 3 years or more on a simple span of 15 m. [18]

Given data:
 $E_s = 200 \times 10^3 \text{ MPa}$, $E_{ci} = 25100 \text{ MPa}$, $E_c = 27400 \text{ MPa}$
 $f_{pu} = 1860 \text{ MPa}$, Initial prestress $f_i = 1300 \text{ MPa}$, Shrinkage strain, $\epsilon_{sh} = 0.00025$
 Values of K_{re} , J and C provided in Table attached

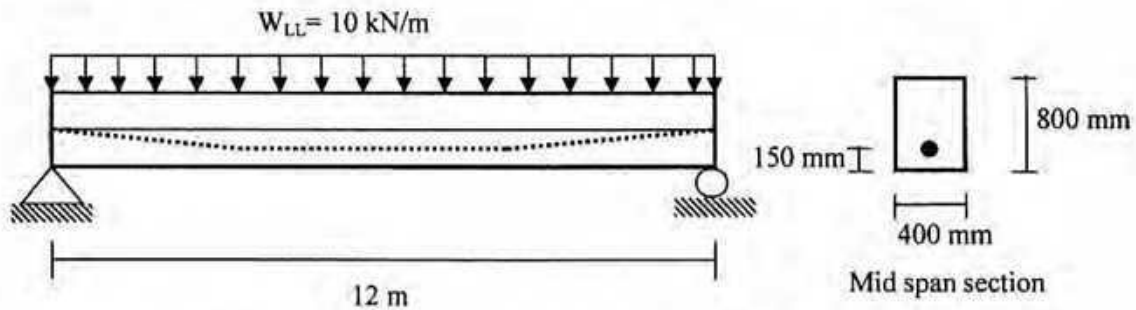
Formula: $CR = K_{cr} E_s / E_c (f_{cir} - f_{cds})$, $RE = [K_{re} - J(SH + CR + ES)]C$



b) Give a list of sources of losses in prestressed concrete [2]

3. (a) A posttensioned bonded concrete beam has a prestress of 1550 kN in the steel immediately after prestressing, which eventually reduces to 1340 kN due to losses. The beam carries a uniformly distributed live load of 10 kN/m in addition to its own weight of 7.7 kN/m. Compute the extreme fiber stresses in mid-span. [12]

- under the initial condition with full prestress and no live load
- under the final condition, after the losses have taken place with full live load.



(b) For the beam loaded as in Q-4(a), compute the value of total dead and live load (UDL) that can be carried by the beam, for cracking in the bottom fibers at a modulus of rupture of 3.6 MPa and assuming that concrete can take tension upto that value. Also calculate the load factor against cracking. [04]

(c) Mention the ACI specification for stress in concrete and steel for prestressed concrete at (i) Initial case [04]
(ii) Service condition

Appendix

Table: Values of K_{re} and J

Type of Tendon	K_{re} (Mpa)	J
1860 MPa Grade stress-relieved strand or wire	138	0.15
1720 MPa Grade stress-relieved strand or wire	128	0.14
1655 MPa or 1620 MPa Grade stress-relieved wire	121	0.13
1860 MPa Grade low-relaxation strand	35	0.040
1720 MPa Grade low-relaxation s wire	32	0.037
1655 MPa or 1620 MPa Grade low-relaxation strand wire	30	0.035
1000 MPa or 1100 MPa Grade stress-relieved bar	41	0.05

Table: Values C

f_{pi}/f_{pu}	Stress relieve strand and wire	Stress relieved bar or low relaxation strand or wire
0.80		1.28
0.79		1.22
0.78		1.16
0.77		1.11
0.76		1.05
0.75	1.45	1.00
0.74	1.36	0.95
0.73	1.27	0.90
0.72	1.18	0.85
0.71	1.09	0.80
0.70	1.00	0.75
0.69	0.94	0.70
0.68	0.89	0.66
0.67	0.83	0.61
0.66	0.78	0.57
0.65	0.73	0.53
0.64	0.68	0.49
0.63	0.63	0.45
0.62	0.58	0.41
0.61	0.53	0.37
0.60	0.49	0.33

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

Course Title: Environmental Engineering III Course# CE 431 Credit: 2.00
Time- 1 hour **Full marks: 60**

*There are **Four** questions Answer any **Three***
(3 X 20= 60)

- (1) (a) Discuss with figure the functional elements of a complete solid waste management (12)
(b) Which factors influence the quantities of solid waste generation (8)
(2) (a) Describes shortly with diagram of recycling and resources recovery system in urban centers. (8)
(b) Using the typical percentage distribution data given below the table, estimate the energy of each fraction the solid wastes. If 80% of the cardboard, 80% of paper and 80% of yard wastes are recovered by the home owner, also estimate the remaining energy of solid wastes. (12)

Component	Weight (%)
Food waste	32.5
Paper (mixed)	35
News print	5
Cardboard	4
Rubber	0.5
Plastics	3
PVC	0.5
Leather shoe	0.5
Textiles	3
Yard waste	13
wood	3

- (3). (a) Write down advantages of source reduction and on-site processing of solid waste. (5)
(b) Solid waste from a new industrial park is to be collected in large containers, some of which will be used in conjunction with stationary compactors. Based on traffic studies at similar parks, it is estimated that the average time to drive from the garage to the first container (t_1) and from the last container (t_2) to the garage each day will be 30 and 25 minutes, respectively. The average time required to drive between containers is 7 minutes and the one-way distance to the disposal site is 30 km (speed limit: 88 km/h). Length of working day= 7h (15)
- Determine the no. of trips per day
 - Determine the actual length of the working day.

(4) (a) Write down the benefits of transfer station?

(5)

(b) Solid wastes from Dhanmondi area to be collected using a stationary Container collection system having 5 cubic meter containers. Determine the appropriate truck capacity for the following conditions:

(15)

- Container utilization factor = 0.70
- Average number of containers at each location = 2
- Collection – vehicle compaction ratio = 2.5
- Container unloading time = 0.15 h
- One way haul distance = 35 km
- Speed limit = 72 km/hr
- Time from garage to first container location = 0.25 h
- Time from garage to last container location = 0.35 h
- Number of trips to disposal site per day = 2
- Length of working day = 8h

Answer any **THREE** questions out of **FOUR**.

Question 1:

33¹/₃

The MI Cement factory (brown cement) in Munshiganj is located on the east bank of the river Buriganga. There is a paddy field spread over on the north-east side. The width of the river at plant site is about one kilometer. The environmental impacts of the plant will be assessed using Environmental Evaluation System. Values in environmental qualities with and without project are given below:

Table 1: Values of environmental qualities

Parameters	With project	Without project
1. Land value	5	2
2. Navigation	5	6
3. Socio-economic condition	10	1
4. Air quality	3	8
5. Agriculture	3	5
6. Human health	6	8

Assume reasonable data for Environmental Importance with a brief justification. Determine whether the project is environmentally sustainable or not.

Question 2. Discuss briefly the potential environmental impacts of an Embankment Project. 33¹/₃

Question 3. Discuss briefly the potential environmental impacts of Upazilla Irrigation Project. 33¹/₃

Question 4. Discuss briefly the potential environmental impacts of Upazilla Road Project. 33¹/₃

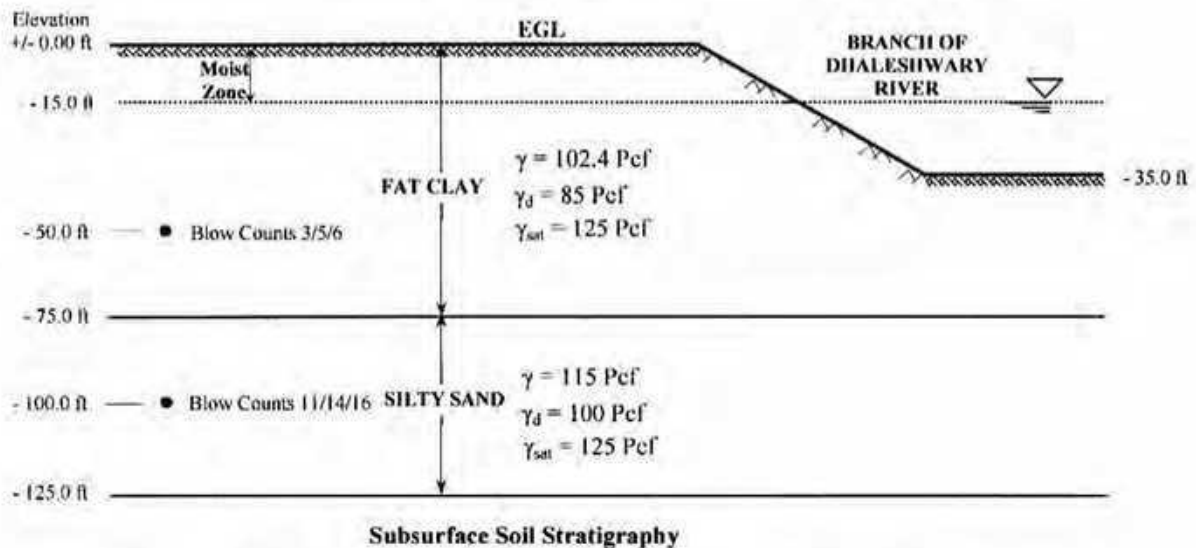
The University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination, Fall 2010

Course # CE 441
 Full Marks: 60 (20 x 3 = 60)

Course Title: Geotechnical Engineering II
 Time: 1 hour

Answer any **three (3)** of the following **four (4)** questions

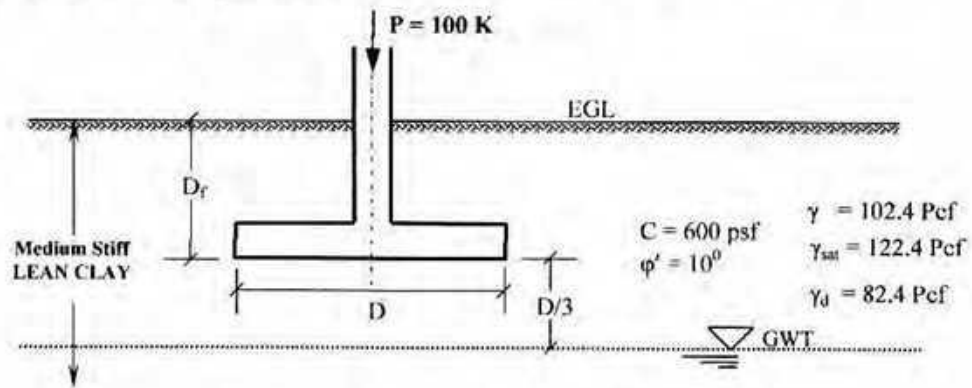
1. (a) What is subsurface exploration in terms of geotechnical engineering? Mention four major purposes of subsurface exploration. Step down the phases (mention only) of geotechnical subsurface exploration. 10
- (b) Mention four observations that should be noted by a good geotechnical engineer while visually inspecting the site as a part of reconnaissance phase of a subsurface exploration program. 4
- (c) 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. 6
2. (a) Write short notes on any two of the following:
 (i) Standard Penetration Test (ii) Cone Penetration Test (iii) Logging 7
- (b) A **preliminary** geotechnical site investigation was conducted at a local site within Dhaka City. The following information about field blow counts and subsurface stratigraphy are available as shown in the following figure below and mentioned herein. 13
 Determine undrained cohesion and angle of internal friction at corresponding depths of the clay and sand deposits, based on the available data (Use empirical correlations as provided in **Appendix**).



3. (a) Show with sketches different types of shear failures for soils of different strength. 4.5
- (b) Write down the factors considered in general bearing capacity equation which were not considered in Terzaghi's bearing capacity equation. 3

- (c) Using Terzaghi's bearing capacity equation, design the size of the circular footing for the conditions as shown in the figure below. Use $D = D_f$.

12.5



4. Using general bearing capacity equation, an entry-level engineer designed a square foundation for a column load of 150 kN for the soil conditions as shown in the following FIGURE (A). In his design he did not consider the effect of ground water condition. Other than that his calculations were correct and the footing size was found to be 1.3 m X 1.3 m with a FS = 3.

20

His design was not properly reviewed and the structure was constructed. The site investigation revealed that the GW was at the EGL. You are now involved in reviewing his design. Considering the actual GW condition as shown in FIGURE (B), what would be the actual ultimate load (P_u) that the column can take? Also calculate the actual FS the structure is having now.

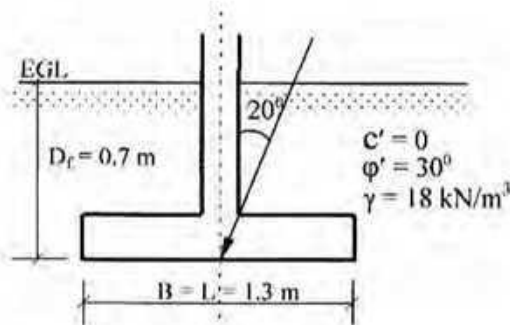


FIGURE (A)

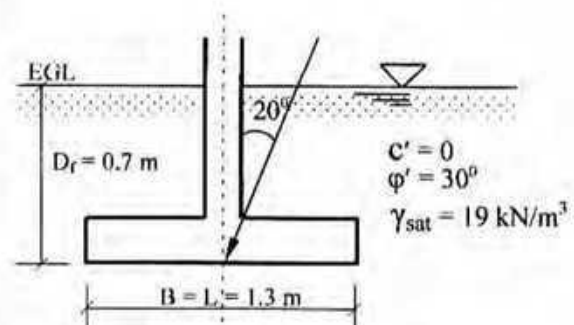


FIGURE (B)

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

Course Code: CE 451

Course Title: Transportation Engineering-II:
Highway Design & Railways
Time: 1 hour

Full Marks:60

(There are **FOUR** questions. Answer any **THREE**)

1. (a) What is dual gauge? Write down some factors that affect the selection of different gauges? (2+8)
- (b) Why generally the followings are favored? (5+5)
i) Flat footed rail ii) Broken Stone

2. (a) What are the requirements for an ideal rail section? (8)
- (b) Describe the functions of the following fittings and fastening : (3×4)
i) Dog Spikes
ii) Fish Plate
iii) Pandrol Clip

3. (a) What are the functions of sleepers? (6)
- (b) What is Degree of Curve? (2)
- (c) Calculate the maximum permissible train load that can be pulled by a locomotive with 4 pairs of driving wheels having an axle load of 20 tons each on a straight level M.G. track at a speed of 80 kmph. Also calculate the reduction in speed if the train has to run on a rising gradient of 1 in 150. What would be the further reduction in speed if the train has to negotiate a 6° curve on the rising gradient? Assume coefficient of friction as 0.2. (12)

4. (a) What are the disadvantages of coning of wheels? (5)
- (b) Write a short note on "Cant Deficiency". (3)
- (c) What are the difference between "Station" and "Yard"? (4)
- (d) Describe different components of a "Switch"? (8)

The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2010

Course #: CE 461

Course Title: Irrigation and Flood Control

Time: 1 hour

Total Marks: 60

Section A

Answer all questions

1. Define the following (any four) (10)
 - a. Water distribution efficiency
 - b. Optimum Utilization of Irrigation water
 - c. Consumptive use
 - d. Net Irrigation Requirement
 - e. Intensity of irrigation
 - f. Soil-moisture-Irrigation relationship
2. Sketch the typical layout of a canal system. (4)
3. What are the different ways in which the irrigation canals can be aligned? Briefly describe "Furrow irrigation method" (6)
4. Sketch a typical cross section of an irrigation canal. What are the purposes of having berms in an irrigation canal? (2+3)
5. What are the advantages of canal lining and how to find its economic viability? (2+3)
6. After how many days will you supply water to soil in order to ensure sufficient irrigation of the given crop, if, (6)

Field capacity of the soil = 27%

Permanent wilting point = 12%

Dry density of soil = 1.3 gm/cc

Effective depth of root zone = 7.5 cm

Daily consumptive use of water for the given crop = 10 mm.
7. The discharge available from a tubewell is $136 \text{ m}^3/\text{hr}$. Assuming 3000 hours of working for this tubewell in a year, estimate the culturable area that this tubewell can command. The intensity of irrigation is 50 % and the average water depth required for the Rabi and Kharif crops is 51 cm. (4)

Section B

Answer Question no.1 and any ONE from the rest

1. Explain the following (any four) (12)
 - i) Define Flood
 - ii) Name the Critical characteristics of flood hazard
 - iii) Channel capacity
 - iv) Catastrophic flood
 - v) Flood plain
2. Write short note on "flood and the poor" (8)
3. What are the types and causes of flood in Bangladesh? (4+4)

The University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination, Fall 2010

Course No : CE 531
 Time : 1 hour

Credit Hour : 2.0
 Total Marks : 20

Name:.....Registration No:.....

Roll No:.....

Instructions:

1. Answer all questions.
2. Call your teacher whenever you finish the task.
3. The figures in the right margin indicate full marks.

(6+1+2+1=10)

1. Add a theme called **districts.shp** to your view. The theme contains 64 districts in Bangladesh. The Department of Environment (DoE) wants to prepare a map of arsenic affected districts in Bangladesh. The districts may be divided into three zones:
 (a) Red (**highly affected**) (b) Yellow (**affected**) (c) Green (**not-affected**).

The status of 64 districts are as follows (For data entry go first top to down, and then left to right)

Red	Yellow	Red	Green	Green
Green	Red	Yellow	Red	Red
Red	Green	Red	Green	Red
Green	Red	Yellow	Red	Yellow
Yellow	Red	Green	Yellow	Green
Red	Yellow	Red	Green	Green
Green	Red	Yellow	Red	Red
Red	Green	Red	Green	Red
Red	Red	Yellow	Red	Green
Green	Red	Yellow	Red	Red
Red	Green	Red	Green	Red
Red	Red	Yellow	Red	Yellow
Yellow	Red	Green	Yellow	-

- (a) Prepare a map of arsenic affected districts in Bangladesh.
- (b) Give the theme name as "level".
- (c) Create a layout which should contains the followings,
 - (i) Title Name: Arsenic Affected District in Bangladesh
 - (ii) Scale bar

(iii) North Arrow

(iv) A photo (attached herewith as a photo.jpg file)

(d) Export the file as Windows Bitmap

2. The UAP campus (campus.gif) is situated at Dhaka, Khulna and Sylhet districts. Hot link UAP proposed permanent campus building at those areas. 5

3. Please add EXCEL dbf file called population. Add this table to the main table. Create a chart showing the relation between 'code' and 'district'. 5

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

Course Title: Chemistry
Time: 1 Hour

Course Code: CHEM 111
Full Marks: 40

There are FIVE Questions. Answer any FOUR.

- | | | |
|---|--|------------|
| 1 | (a) Mention the three postulates of Rutherford's solar system atom model.
(b) Describe briefly the Rutherford's gold foil experiment. | 5.0
5.0 |
| 2 | (a) What are the fundamental particles ? Describe them briefly.
(b) An atom 'A' has atomic number 90 and atomic weight 240.02. Find the number of fundamental particles of the atom. | 5.0
5.0 |
| 3 | (a) Define isotope. Write the name and symbols of hydrogen isotopes.
(b) Draw the atomic structures and also find the fundamental particles of the following isotopes:
${}_{17}\text{Cl}^{35}$ and ${}_{17}\text{Cl}^{37}$ | 5.0
5.0 |
| 4 | (a) Define proton number and mass number? How are they related?
(b) Discuss the atomic spectra of hydrogen. | 5.0
5.0 |
| 5 | (a) What is 'orbital'? Draw the three dimensional <i>p</i> -orbitals.
(b) Discuss the Azimuthal quantum number. | 5.0
5.0 |

The University of Asia Pacific
Department of Civil Engineering
Mid Term Examination, Fall - 2010
Program: B. Sc Engineering (2nd Year/ 1st Semester)

Course Title: Basic Electrical Engineering

Course No. ECE 201

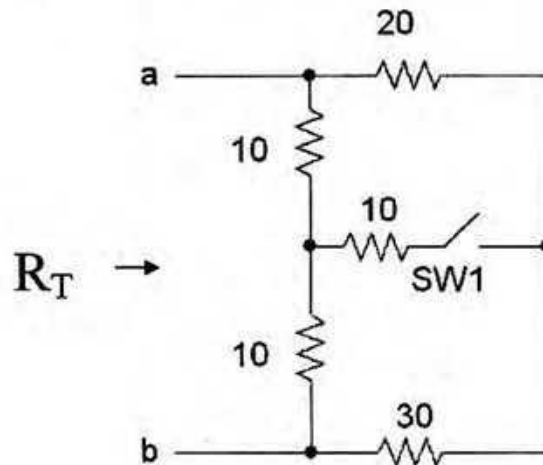
Credit Hours: 3.00

Time: 1.00 Hour

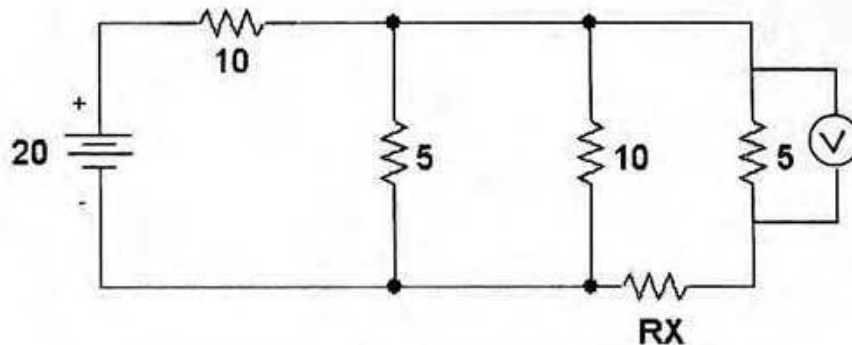
Full Marks: 60

[There are **four** questions. Answer any **three**. Figures in the right margin indicate marks]

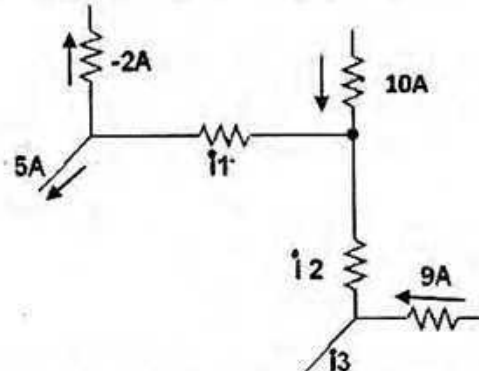
- 1 a. Define the following term 10
 - i) Voltage
 - ii) Current
 - iii) Power
 - iv) Active element
 - v) Dependent source
- b. Find out R_T at the terminal a-b i) when SW1 (switch) is open ii) when SW1 (switch) is closed. All the resistances are in ohms. 10



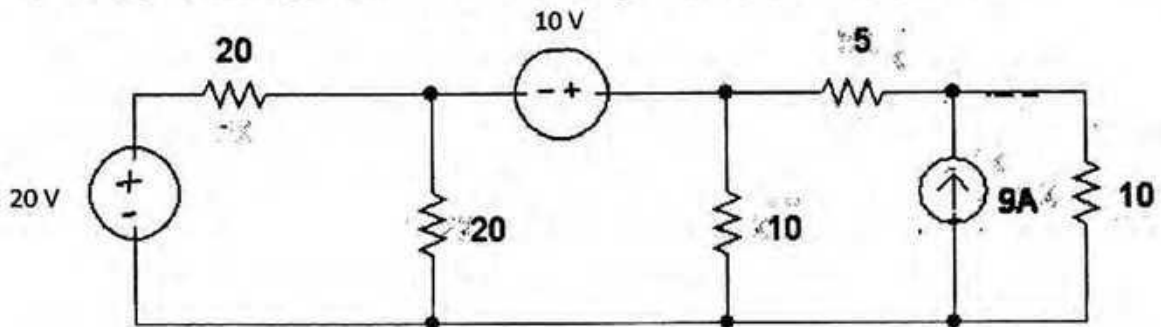
- 2 a. State KVL and ohm's Law. 5
- b. Find out equation of current in a straight conductor. 5
- c. In the following circuit power dissipated by R_x in one eighth of the total power. Find out the Voltmeter reading and also the value of R_x . Given that $R_T = 12.5$ 10
 All the resistances are in ohms.



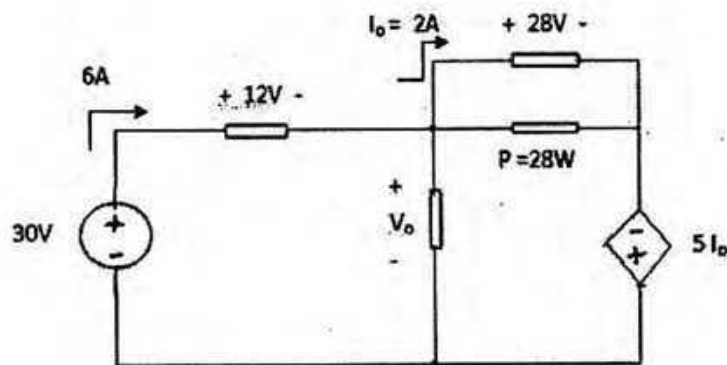
- 3 a. What do you understand by short and open circuit condition ? 5
 b. Find out the value and the direction of unknown current in the given circuit 5



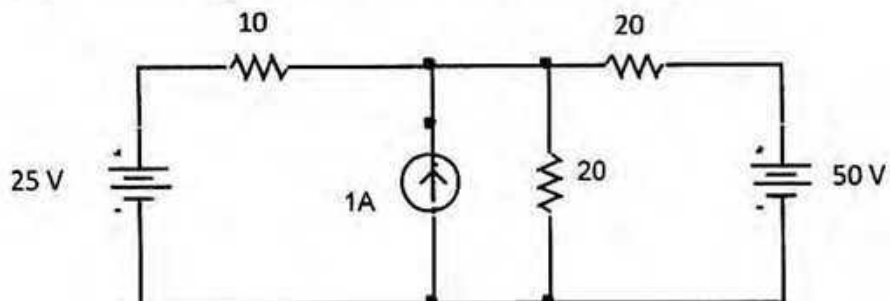
- c. Using Nodal analysis find out the node voltage . All the resistances are in ohms. 10



- 4 a. Find out V_o 10



- b. What is supermesh? Using mesh analysis find out mesh currents. 10



Marks Obtained	<input type="text"/>	<input type="text"/>
.....		
Signature of Examiner/Date		

The University of Asia Pacific
Mid Term Examination
FALL 2010
Course No.: HSS 101
Course Title: English Language 1

.....
Signature of Invigilator
Date:

Time- 1:00 hour

Total Marks- 20

Name: Registration no:..... Department:

Write all answers on the question paper

Q.1. The following extract is about Nick and Carol. Read and then complete the questions. **5**

Nick and Carol are doing voluntary work in Kenya for a year. They got married last year, but decided to live abroad before starting their careers. They are staying at Camp Kenya with fifty other volunteers, who come from all over the world. Carol teaches English, and Nick helps local people to build schools and playgrounds. 'The kids love football,' says Nick, 'and now they've got a real pitch to play on.' When Nick and Carol go back to England, they're going to be teachers.

- a. What Kenya?
- b. When marry?
- c. How many?
- d. How local people?
- e. after they go back to England?

Q.2. Complete the following sentences using appropriate preposition (any three) **3**

- a. Ask her to come Sunday 3:00 P.M.
- b. my stay Syria I visited many interesting places.
- c. He started the job May 3rd and continued July 6th
- d. I went home the weekend and returned last Sunday.

Q.3. Complete the following sentences using appropriate forms of Pronouns

2

Dear Hassan,

How are you? Atif and ----- are having a marvelous holiday. We're really enjoying -----An uncle of ----- stays here and we are staying in his house which is near the beach. I bought three shirts from the local market and I like ----- all. Atif is a bit annoyed because the shirts ----- bought aren't as good as -----, We talk about you a lot and think that you are also enjoying ----- on ----- trip to England.

Q.4. Complete the following sentences with negatives. (Any four)

3

1. I wrote the mail but -----.
2. She loves to sleep. She -----morning.
3. Habib has a lot of friends but Shafi-----any.
4. Although they bought the house -----
5. Karim is a good talker but his sister-----
6. Horses -----horns.

Q.5. Write a biography (using past tenses) of Mahatma Gandhi, the pioneer of non-violence movement, from the information below:

7

- 2 Oct 1869** Mohandas Karamchand Gandhi is born.
- 1882** Gandhi marries Kasturbai Nakanji - both of them are thirteen.
- 1888** Trains as a lawyer in London.
- 1893** Gandhi starts work in South Africa
- 1896** Returns to India
- 1904** Founds the periodical "Indian Opinion" and the Phoenix Farm
- 1908** Starts **Satyagraha** campaign
- 1920** Gandhi becomes leader of the Congress Party/INC (until 1934)
Starts non-cooperation campaign. Gandhi is sentenced to six years imprisonment
- 1924** Gandhi is released early from prison
- 1925** Autobiography "My Experiments with Truth" is published
- 1930** "Salt march" from Ahmedabad to Dandi
- 1931** Gandhi begins to stand up for India's untouchables - those without a caste
- 1947** Partition of British-run India into Muslim Pakistan and Hindu India
Independence for both states (15th August)
- 1948** Gandhi is shot by a Hindi fanatic New Delhi (30th January)

The University of Asia Pacific
Department of Architecture/ DBA/CE/ CSE
Mid- Semester Examination Fall-2010
Program: B Arch/ BBA/ B.Sc Engineering
1st Year 2nd Semester

Course Code: HSS 103
Time: 1.00 Hour

Course Title: English Language II

Credit: 3 .00 (three)
Full Mark: 40 (20)

.....
Invigilator's Signature

.....
Examiner's Signature

Name:

Department:

Roll # :

Reg. #

Marks Obtained:

(Answer all the questions on the question paper)

1. Change the forms of voice of any ten (10) of the following sentences:

10

a) I don't know what he will say.

Ans:

b) Shall I submit the assignment tomorrow?

Ans:

c) Eat up your dinner at once.

Ans:

d) We must listen to his words.

Ans:

e) Alas! We shall hear his voice no more.

Ans:

f) Who taught you French and gave you a dictionary?

Ans:

g) I am watching you very carefully.

Ans:

h) The manager will give you a ticket.

Ans:

i) The policeman asked me my name and address.

Ans:

j) He made a very remarkable discovery.

Ans:

k) We expect good news.

Ans:

l) A stone struck me on the head.

Ans:

2. Change the forms of speech of any ten (10) of the following sentences:

10

a) My colleague said to me, "I'll leave it on the table."

Ans:

b) Father said to me, "Get your hair cut."

Ans:

c) My friend said to me, "Let us wait for the award"

Ans:

d) He said "We are all sinners"

Ans:

e) The teacher said to his student, "May you succeed in everything you do."

Ans:

f) He said, "Alas! Our foes are too strong."

Ans:

g) My teacher always says to me, "If you do not work hard, you will fail."

Ans:

h) He said, "I shall do it on time."

Ans:

i) He said to me, "Do you write a good hand?"

Ans:

j) He wrote "I am unable to come just now because I am ill."

Ans:

k) "Call the first witness," said the judge.

Ans:

l) He enquired, "When do you intend to pay me?"

Ans:

3. Make Sentences with any five (5) of the following idioms:

05

a) Black sheep:

b) Yellow journalism:

c) Green with envy:

d) Red handed:.....

e) Blue collar worker:

f) White lies:.....

g) At finger tips:.....

4. Correct any ten (10) of the following sentences:

10

a) There are less students in the class today.

Ans:

b) All the paragraphs in this essay is well-written.

Ans:

c) The criminal was hung for his crimes.

Ans:

d) I let him to understand the issue.

Ans:

e) He as well as his friends are gentlemen.

Ans:

f) Its really a very interesting story.

Ans:

g) Two-thirds of the team concedes to the request.

Ans:

h) He was used to work very hard when he was well.

Ans:

i) Today I got up more earlier than yesterday.

Ans:

j) Neither the chairman nor the directors is present.

Ans:

k) He has proved his skills qualities since being appointed as the manager.

Ans:

l) Fifty thousand dollars suffices his demand.

Ans:

5. Complete any five (05) of the following conditional sentences:

05

a) It would be nice idea if.....

b) If you had done the work on time,

c) If you trust me,

d) I would take an umbrella, if

e) It would have been appreciated, if

f) If you called me earlier,

g) If you switch on,

The University of Asia Pacific
The Department of Interdepartmental Courses
Mid Semester Examination, Fall 2010
Programmes: BArch, BBA, BSc Engineering (CE, CSE, EEE)

Course Title: Bangladesh Studies: Society and Culture **Course Code: HSS 111(a)**
Credit: 2.00 **HSS 211(a) [for CE]**

Time: 1 Hour

Full Marks: 40

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** (3x10)

1. Define Sociology. Discuss the subject matter of Sociology.
2. Discuss on the method of participant observation. Which type of societies should follow this method?
3. Define social structure. Discuss the functional pre-requisites of a society.
4. Discuss the features of human society.

SECTION B

There are **TWO** questions in this section. Answer **ALL** (2x5)

Write in brief:

1. Association and Institution
2. Classification of Groups

The University of Asia Pacific
The Department of Interdepartmental Courses
Mid Semester Examination, Fall 2010
Programmes: BBA, BSc Engineering (CE, CSE, EEE)

Course Title: Bangladesh Studies: History of Bangladesh
Credit: 2.00

Course Code: HSS 111(B)
HSS 211(B) [for CE]

Time: 1 Hour

Full Marks: 40

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** (3x10)

1. Describe the geographical position of Bangladesh.
2. Who was Shasanka? Describe the ruling period of Shasanka.
3. Describe the development of Bengali language.
4. Who were Barabhuyians? Narrate the history of Barabhuyians.

SECTION B

There are **TWO** questions in this section. Answer them **ALL** (2x5)

Write in Brief:

1. Medieval age in Bengal
2. Rabindranath Tagore.

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

Course Title: Principles of Management
Time: 1 hour

Course Code: IMG 301
Full Marks: 20

Choose any two (2) of the following three (3) questions.

1. (a) Who is a manager? Explain the different skills of managers with examples. (5)
(b) Identify and discuss the factor of Task Environment. (5)

2. (a) "Management is both a science and an art" – Explain. (3)
(b) What is organizational culture and where does an organization's culture come from?
Discuss with examples. (3)
(c) Write about the elements of Internal Environment of an organization. (4)

3. (a) Discuss all the dimension of General environment with proper examples. (6)
(b) Explain the various roles a manager has to perform. (4)

THE UNIVERSITY OF ASIA PACIFIC
Department of Interdepartmental Courses
Mid-Semester Examination Fall - 2010
Program: B.Sc. Engineering (Civil)

Course Title: Mathematics-I
Time: 1.00 Hr.

Course Code: MTH-101

Credit: 3.00
Full Marks: 60

Answer any four of the followings:

Q1.(a) Define function and injective function and constant function with examples. (6)

(b) Define domain and range of a function $f(x)$. Sketch and determine the domain and range of the following functions (any two): (9)

(i) $f(x) = \sqrt{x+1} - 1$ (ii) $f(x) = |\sin x| + 1$ (iii) $f(x) = |x-2| + |x-4|$

Q2. (a) Define continuity of a function $f(x)$ at a point $x = c$. Test the continuity of $f(x)$ at $x = 1$, where

$$f(x) = \begin{cases} x^2 + 2, & x \leq 1 \\ x + 2, & x > 1. \end{cases}$$

Also sketch the graph of the function $f(x)$. (8)

(b) Define $\delta - \epsilon$ definition of continuity of $f(x)$ at $x = a$. Prove that $\lim_{x \rightarrow 3} 4x - 5 = 7$ (7)

Q3. (a) Define continuity from the left and continuity from the right. Test the Continuity of $f(x) = \sqrt{1-x^2}$ on $[-1, 1]$. (10)

(b) Can a function with no limit be continuous? Discuss. (5)

Q4. (a) Define differentiability of a function $f(x)$ at a point $x = a$. Test the differentiability of $f(x)$ at $x = 1$, where, $f(x) = |x| + |x-1|$. (10)

(b) Define tangent line and secant line. Differentiate $f(x) = \cos x$ by the fundamental rule. (5)

Q5. (a) Define Chain rule. Use this rule to find the differential coefficients of the functions $y = e^{\sin x}, \sin a^x$ with respect to x . (7)

(b) Oil spilled from a ruptured tanker spreads in a circle whose radius increases at a rate of 0.56 m/s. How fast will the area of the circle increase when the radius is 1.69 square meter? (8)

THE UNIVERSITY OF ASIA PACIFIC
Department of Interdepartmental Courses
Mid-Semester Examination Fall - 2010
Program: B.Sc. Engineering (Civil)

Course Title: Mathematics-II
Time: 1.00 Hr.

Course Code: MTH-103

Credit: 3.00
Full Marks: 60

Answer any four of the followings:

4×15 = 60

1. Find the equation of the plane through $(-1, 3, 2)$ and perpendicular to two planes $x + 3y + 2z = 5$ and $3x + 3y + 2z = 8$.

2. Obtain the equation of the plane which contains the line $x = \frac{y-3}{2} = \frac{z-5}{3}$ and which is perpendicular to the plane $2x + 7y - 3z = 1$.

3. If a sphere passes through the points $(1, -3, 4)$, $(1, -5, 2)$ and $(1, -3, 0)$ and whose centre lies on the plane $x + y + z = 0$ then find the equation of the sphere.

4. Show that the plane $2x - 2y + z + 12 = 0$ touches the sphere $x^2 + y^2 + z^2 - 2x - 4y + 2z - 3 = 0$ and find the point of contact.

5. A tangent plane to the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ meets the co-ordinate axes in points P, Q and R. Prove that the centroid of the triangle PQR lies on the locus $\frac{a^2}{x^2} + \frac{b^2}{y^2} + \frac{c^2}{z^2} = 9$.

THE UNIVERSITY OF ASIA PACIFIC
Department of Interdepartmental Courses
Mid-Semester Examination Fall - 2010
Program: B.Sc. Engineering (Civil)

Course Title: Mathematics-III
Time: 1.00 Hr.

Course Code: MTH-201

Credit: 3.00
Full Marks: 60

Answer any four of the followings:

$4 \times 15 = 60$

1. (a) If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, show that $A^2 - 4A - 5I = 0$ (6)

(b) Define the rank of a matrix. Find the rank of the following matrix: (9)

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \\ 3 & 4 & 1 & 2 \end{bmatrix}$$

2. (a) Find the inverse of the following matrix by adjoining: (7)

$$A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 3 & 4 \\ 1 & 4 & 3 \end{bmatrix}$$

(b) Find the solution of the following system of linear equations using Cramer's rule:

$$\begin{aligned} x_1 + x_2 + x_3 &= 4 \\ 2x_1 + 5x_2 - 2x_3 &= 3 \\ x_1 + 7x_2 - 7x_3 &= 5 \end{aligned} \quad (8)$$

3. Show that the adjoint of $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ is $3A'$ and the adjoint of

$$B = \begin{bmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix} \text{ is } B \text{ itself.} \quad (15)$$

4. Define invertible matrix. Find A^{-1} of the matrix (15)

$$A = \begin{pmatrix} 1 & 0 & 2 \\ 2 & -1 & 3 \\ 4 & 1 & 8 \end{pmatrix} \text{ by elementary row operations. Verify your result.}$$

5. Determine the values of k such that the system in unknowns x, y and z has (i) a unique solution (ii) no solution and (iii) more than one solution

$$\begin{aligned} x + y + kz &= 2 \\ 3x + 4y + 2z &= k \\ 2x + 3y - z &= 1 \end{aligned} \quad (15)$$

THE UNIVERSITY OF ASIA PACIFIC
Department of Interdepartmental Courses
Mid-Semester Examination Fall - 2010
Program: B.Sc. Engineering (Civil)

Course Title: Mathematics-IV
Time: 1.00 Hr.

Course Code: MTH-203

Credit: 3.00
Full Marks: 60

Answer any four of the followings:

1. (a) If $L\{F(t)\} = f(s)$, Show that $L\{F''(t)\} = s^2 f(s) - sF(0) - F'(0)$ 8

(b) Given $F(t) = \begin{cases} t^2 & , 0 < t \leq 1 \\ 0 & , t > 1 \end{cases}$, find $L\{F''(t)\}$ 7

2. (a) If $F_1(t), F_2(t), \dots, \dots, F_n(t)$ have Laplace transforms $f_1(s), f_2(s), \dots, \dots, f_n(s)$ respectively and $c_1, c_2, \dots, \dots, c_n$ are any constants, prove that 8

$$L\{c_1 F_1(t) + c_2 F_2(t) + \dots + c_n F_n(t)\} = c_1 f_1(s) + c_2 f_2(s) + \dots + c_n f_n(s)$$

(b) Find $L\{F(t)\}$, if $F(t) = \begin{cases} \cos(t - \frac{2\pi}{3}), & t > \frac{2\pi}{3} \\ 0 & , t < \frac{2\pi}{3} \end{cases}$ 7

3. (a) Find each of the following 6

(i) $L\{3t^4 - 2t^3 + 4e^{-3t} - 2\sin 5t + 3\cosh 2t\}$

(ii) $L\{(t+2)^2 e^t\}$

(b) If $L\{F(t)\} = \frac{e^{-1/s}}{s}$, find $L\{e^{-t} F(3t)\}$ 4

(c) Find $L\{(1+te^{-t})^3\}$ 5

4. Form an ordinary differential equation from the following equation: 15

$$y = x^2 + c_1 x + c_2 e^{-x}.$$

5. Solve the following ordinary differential equation: 15

$$\frac{dy}{dx} + y = xy^3$$

The University of Asia Pacific
Department of Interdepartmental Courses
Mid Semester Examination Fall - 2010
Program: B.Sc Engineering (CSE/CE/ARCH)

Course Title: Physics I
Time: 1.00 Hour

Course Code: PHY-101

Credit: 3.00
Full Mark: 60

[N.B- The figures in the margin indicate full marks. There are FIVE questions. Answer any FOUR]

1. (a) Define free vibration of sound wave. 5
(b) Solve the differential equation of undamped vibration of sound wave and prove the frequency of the oscillation $n = \frac{1}{2\pi} \sqrt{\frac{k}{m}}$ 10
2. (a) What is called Lissajous' figure? 3
(b) State and explain composition of two simple harmonic motions of sound wave and also prove that $y = A \sin \omega t + \phi$ 12
3. (a) What is mean free path? Deduce an equation of mean free path by Clausius assumption. 10
(b) Calculate the mean free path of a gas molecule, given that the molecular diameter is $2 \times 10^{-8} \text{ cm}$ and the number of molecules is 3×10^{19} . 5
4. (a) State the equipartition theorem. Show that the average kinetic energy associated with each degree of freedom = $\frac{1}{2} kT$. 10
(b) At what Celsius temperature will oxygen molecules have the same root mean square velocity as that of hydrogen molecules at -100°C ? 5
5. (a) Show that Work done during an adiabatic process is $W = \frac{1}{1-\gamma} [RT_2 - RT_1]$ 10
(b) A motor car tyre has a pressure of 2 atmospheres at room temperature of 27°C . If the tyre suddenly bursts, find the resulting temperature. 5