

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Midterm Examination (Spring 2015)**  
**Program: B.Sc. Engg (3<sup>rd</sup> year 1<sup>st</sup> semester)**

**Course Title: Principles of Accounting**  
**Time : 1 hr**

**Course: ACN 301**

**Credit Hours: 2.0**  
**Full marks : 20**

**[Answer all Questions]**

**Q.1.** SMEC BD Ltd began business on January 2012. The company provides real estate service to customers. The adjusted trial balance of the company for the year 2012 is as follows: (all figures are in '000BDT)

**SMEC BD LTD.**  
**Trial Balance (Adjusted)**  
**December 31, 2012**

	<u>Debit</u>	<u>Credit</u>
Cash	14,500	
Accounts Receivable	23,600	
Prepaid Insurance	1,600	
Land	56,000	
Building	106,000	
Equipment	48,000	
Accounts Payable		10,400
Unearned Design Revenue		1,800
Mortgage Payable (Long term)		100,000
Smec, Capital		120,000
Smec, Drawing	20,000	
Consultancy, Revenue		75,600
Design, Revenue		26,200
Salaries Expense	30,000	
Advertising Expense	17,000	
Utilities Expense	15,800	
Insurance Expense	1,500	
Depreciation Expense	6,400	
Accumulated depreciation-Building		2,500
Accumulated depreciation-Equipment		3,900
Interest Expense	10,000	
Interest Payable		10,000
<b>Total</b>	<b>350,400</b>	<b>350,400</b>

**Instructions:**

- a. Prepare an income statement for the year ended December 31, 2012. (5)
- b. Prepare an owner's equity statement for the year ended December 31, 2012. (3)

**Q.2.** The bank statement for Jose Orozco Company shows a balance per bank of \$4,150 on June 30, 2014. On this date the balance of cash per books is \$3,969.85.

**Items to be reconciled:**

- a) There were bank service charges for June of \$25.
- b) A bank memo stated that Bao Dais note for \$900 plus interest earned \$36; less bank collection fee \$5.50 has been collected on June 26. No entry has been made on Orozco's book regarding this transaction.
- c) **Deposits in transit:** June 30 deposit (received by bank on July 2). \$2,890.
- d) **Outstanding checks:** \$2,136.05.
- e) NSF check from J. R. Baron for \$453.20.
- f) **Book Errors:** A customer's check for \$90 has been entered as \$60 in the cash receipts journal by Orozco on June 15.
- g) **Book Errors:** Check no. 742 in the amount \$491 had been entered in the cashbook as \$419, and check no 747 in the amount 58.20 had been entered as \$582. Both checks had been issued to pay for purchase of equipments.

**Instruction:**

**Prepare a bank reconciliation statement for the month of June.**

(7)

**Q.3.** John Devon opened an engineering consulting firm named Denver Designs on March 1, 2015. During March the following transactions were completed:

- Mar 1: Invested BDT 2,50,000 cash in business.
- Mar 2: Purchased equipment for BDT 60,000, paying BDT 40,000 cash and balance on account.
- Mar 5: Billed customers BDT 480,000 for consultancy service provided.
- Mar 18: Paid BDT 15,000 cash on account payable for equipment purchase. (March 2)
- Mar 28: Received cash from customer billed on Mar 5.

**Instruction:**

**Prepare journal entries for March transactions.**

(5)

University of Asia Pacific  
 Department of Civil Engineering  
 MidTerm Examination  
 Spring 2015  
 Program: B.Sc. Engineering (Civil)

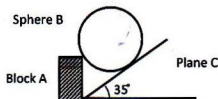
Course Title: Engineering Mechanics I  
 Time: 1 hour

Course Code: CE 101  
 Full Marks: 20

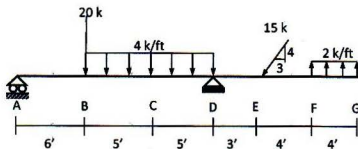
Section A  
 Answer all the questions.

(4x5=20 marks)

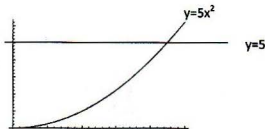
1. Calculate the minimum reaction of block A if sphere B (weight 180 lb) rests on it and plane C as shown below. Also calculate the corresponding normal reaction of plane C. 5



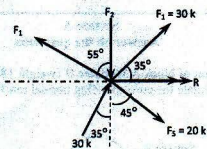
2. In the figure shown below, calculate the reaction at supports A and D and the bending moment at C. 5



3. Find the centroid of the area bound by a curve  $y = 5x^2$  and a straight line  $y = 5$ . 5



4. In the figure below, calculate the magnitudes of the forces  $F_1$  and  $F_2$ . Given that the magnitude of the resultant, of the following coplanar concurrent force system, is 40 k.



**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title : Engineering Mechanics II  
 Time : 3 hours

Course Code: CE 103  
 Full Marks: 10X3=30

(Answer all the questions)

1. Figure 1 shows a homogenous block which weighs 600 lb. Determine the minimum weight  $W$  for motion to impend. Will the block tip or slip?

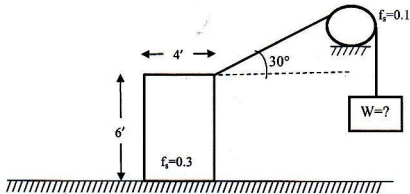


Figure 1

2. Determine the mass moment of inertia of the pendulum about X axis as shown in Figure 2, when unit weight of the material is 450 lb/ft<sup>3</sup>.

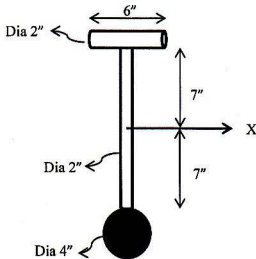


Figure 2

3. Determine the forces in AB, AC and AD to support the 1200 lb crate shown in Figure 3.

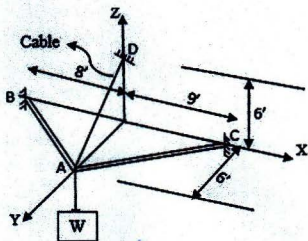


Figure 3

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Surveying  
 Time: 1 Hour

Course Code: CE 105  
 Full Marks: 30

There are Four questions. Answer any Three

1. (a) Explain how you can measure the distance by chain survey between two points on opposite side of a river. (02)
- (b) A base line measured with a steel tape was 1650 m. The steel tape used was 30m long, standardized at 50 degree F with a pull of 15 kg. Find the true length of the base line, if the temperature at the time of measurement was 90 degree F and pull exerted was 26 kg. Weight of 1 cm<sup>3</sup> of steel is 7.86 gm. Weight of tape is 0.6 kg and given that  $E = 2.109 \times 10^6 \text{ kg/cm}^2$ , coefficient of expansion of tape per 1 degree F =  $6.2 \times 10^{-6}$ . (06)
- (c) Show in sketch the radiation method of plane table surveying. (02)
2. (a) Define (03)
  - (i) Datum
  - (ii) Station in leveling process.
  - (iii) Differential leveling

(b)

Station	B.S.	I.S.	F.S.	R.L.(m)	comments
A	2.5			60.0	B.M.
B		1.2			
C		1.6			
D	3.8		3.1		Changing/Turning Point
E	2.7		2.5		Changing/Turning Point
F			3.0		

Calculate the R.L. of stations with necessary arithmetic checks. Follow Height of instrument or Rise and fall method.

3. (a) In an old map, a line was drawn whose magnetic bearing was 5°30'; the magnetic declination at the time being 1° East. If present magnetic declination is 8°30' East, what will be the magnetic bearing of the line? (03)
- (b) The table below gives the lengths and bearings of the lines of a traverse ABCDE. Calculate the length of line DE and line EA. (05)

Line	Length (m)	Whole circle bearing (W.C.B.)
AB	204	87°30'
BC	226	20°20'
CD	187	280°0'
DE	?	210°3'
EA	?	180°28'

- (c) Differentiate between chain surveying and traverse surveying. (02)

4. (a) An excavation is to be made for a reservoir 15 m long and 10 m wide at the bottom, (03)  
having the side slope at 1.5 horizontal to 1 vertical. Calculate the volume of excavation  
if the depth is 5 meters. Ground surface is level before the excavation.

- (b) The following perpendicular offsets were taken from a chain line to a hedge: (04)

Chainage (m)	0	15	30	45	60	70	80	90
Offsets (m)	8.5	7.0	6.2	5.0	6.5	4.0	5.0	6.4

Calculate the area between the survey line, the hedge and the end offsets by

- (i) Trapezoidal rule  
(ii) Simpson's rule
- (c) What is contour? Describe the characteristics of contours. (03)



**University of Asia Pacific**  
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**Mid Semester Examination Spring 2015**  
**Program: B. Sc. Engineering (Civil)**

Course Title: Introduction to Civil and Environmental Engineering  
Time- 1 hour

Course Code: CE 107  
Full marks: 50

## **PART I**

There are **THREE** questions. Question 1 is mandatory. In addition, answer any **ONE** between questions 2 and 3. ( $13+12 = 25$ )

1. (a) Provide one example of application of each of the five branches of Civil Engineering. (5)
- (b) How many liters (L) of water would fill a container that measures  $75 \text{ in}^3$ ? (Hint: Start with converting  $\text{in}^3$  to cubic centimeter (cc). Another rectangular container has an area of  $41.2 \text{ cm}^2$ ; convert the area to  $\text{m}^2$ ). (5)
- (c) Define "Sustainable Development". (3)
  
2. (a) Why life would not be possible on earth without atmosphere? (3)
- (b) Show the flow of matter and energy through ecosystem in a diagram. (6)
- (c) Mention the factors to be considered to ascertain the carrying capacity of earth. (3)
  
3. (a) What is biomass pyramid? How is it formed? (6)
- (b) Name the four processes of biodiversity that lead to evolution. (3)
- (c) Describe the equation that can be used to evaluate the impact of population on environment. (3)

## PART II

There are **THREE** questions. Question 5 is mandatory. In addition, answer any **ONE** between questions 6 and 7. *(13+12 = 25)*

5. (a) Mention few points related to the understanding of science, engineering & technology. (6)
- (b) Define Civil Engineering according to ASCE. (3)
- (c) What are the major foci of any civil engineering project? (2)
- (d) What are the long forms of BNBC and AREA? (2)
6. (a) Discuss, in brief, "civil engineering" as a career. (6)
- (b) Mention the names of some broader interdisciplinary professionals in planning and development of any civil engineering infrastructure system/facility. (3)
- (c) Mention (names only) few types of loads to be considered in design. (3)
7. (a) Categorize building based on the character of occupancy or the type of use. (3)
- (b) What are the major factors for choice of building material? (2)
- (c) Classify building materials based on specific properties. (3)
- (d) Mention four features under the scope of field examination of cement. (4)

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid-Term Examination Spring 2015**

Course Code: CE 201 (A)  
Course Title: Engineering Materials

Time: 1 (one) Hour  
Full Marks: (3x20) = 60

*Answer all questions.*  
*Each question carries equal marks*

**Question # 1**

- a. Describe with figures: Elastic Material, Plastic Material, Elasto-Plastic Material and Elasto-Visco-Plastic Material [10]
- b. State Hook's Law. How 'Modulus of Elasticity' can be found from this law? [5]
- c. Write short notes on modulus of resilience and modulus of toughness [5]

**Question # 2**

- a. Write a short note on ASR. [5]
- b. A sample of fine aggregate has the following properties: [5]  
Wet mass = 625.2 g; Dry mass = 589.9 g; Absorption = 1.6%.  
Determine: (a) total moisture content, and (b) free moisture content
- c. Determine the % proportion of the aggregates to be blended from the following specification. Also determine the F.M. of the blended aggregates. [10]

Sieve size	% Pass			Specification
	Aggregate 1	Aggregate 2	Aggregate 3	
3/8	100	100	100	
No.4	87	100	100	95%
No.8	63	100	100	75%
No.16	19	93	100	
No.30	8	88	100	
No.50	5	55	100	
No.100	3	36	97	
No.200	2	3	88	5%

**Question # 3**

- a. Discuss with figure, different phases in hydration curve. [10]
- b. Show the dry process of cement manufacturing in a neat flow-diagram [5]
- c. Write the names, chemical formula, shorthand notation and typical percentages of the four major compounds form in cement kiln. [5]

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Midterm Examination Spring 2015**

Course #: CE-203

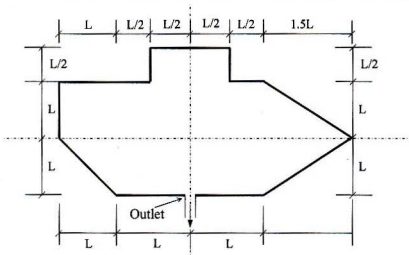
Course Title: Engineering Geology &amp; Geomorphology

Full Marks: 45 (15 X 3 = 45)

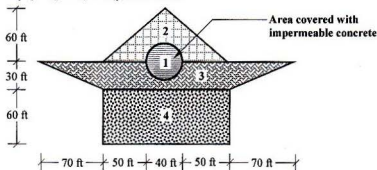
Time: 1 hour

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

- 1a) Draw a schematic diagram showing thicknesses of geosphere/lithosphere. 4
- 1b) Draw a schematic diagram of the rock cycle and provide one example of each type of rock. 5
- 1c) Classify (mention names only) physical and chemical weathering processes. Discuss, in short any one physical weathering process. 6
- 2a) Define precipitation, infiltration and percolation. Draw a schematic diagram of hydrologic cycle and show their relative locations of occurrences in conjunction with runoff. 6
- 2b) For a circular basin with a diameter of 10 km, calculate the Form Factor (FF) and Compactness Co-efficient of the basin. 3
- 2c) Find the FF and CC of the following basin. For  $L = 2$  km, find its axial length. 6



- 3a) Discuss, in short, the dependency of surface runoff on basin characteristics. 4
- 3b) Write down the major assumptions used in rational formula. 4
- 3c) For the drainage area as shown below, calculate peak runoff in  $m^3/s$ . Use  $C_2 = 0.8$ ,  $C_3 = 0.5$  and  $C_4 = 0.7$  and  $I = (C_1 + C_2 + C_3 + C_4)/2$  cm/hour. 7



- 4a) Define flood hydrograph with the aid of a sketch. 2
- 4b) Discuss, in short, a few main features of different types of rock structures. 6
- 4c) Classify fold and fault (mention names only). Draw a neat sketch of oblique fault. 7

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2015**

Course #: CE 205  
Full Marks: 20

Numerical Analysis and Computer Programming  
Time: 1 hr

1. Fit the following data to a linear equation and determine  $x_{14}$ .

[05]

DATA	
$x$	$y$
2	2
4	4
6	4
8	5
10	5
12	7
14	

2. Find the root of the equation  $x^3 + 3x - 5 = 0$  by Bisection method. Where  $[1, 2]$  and  $\epsilon = 0.001$ .

[05]

3. Use Gauss-Seidal method to approximate the solution of the following system of linear equations. to solve the following system of linear equation.

[05]

$$5x - 2y + 3z = -1$$

$$-3x + 9y + z = 2$$

$$2x - y - 7z = 3$$

4. Use Cramers Rule to solve the following system of linear equation.

[05]

$$x - 3z = -5$$

$$2x - y + 2z = 16$$

$$7x - 3y - 5z = 19$$

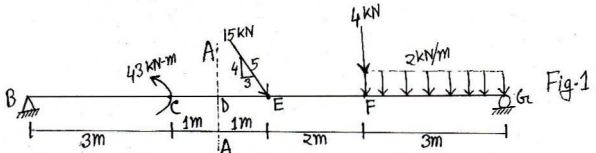
University of Asia Pacific  
 Department of Civil Engineering  
 Mid-Term Examination Spring 2015

Course Code: CE 211  
 Course Title: Mechanics of Solids I

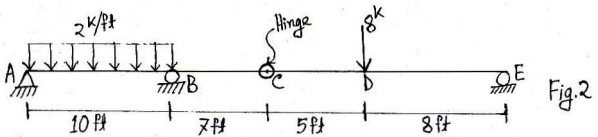
Time: 1 (one) Hour  
 Full Marks: (3\*10) = 30

Answer all questions. Each question carries equal marks.

- Find the reactions for the beam shown in fig.1 . Determine Axial Force, Shear Force and Bending Moment at section A-A for the beam and also draw Axial Force, Shear Force and Bending Moment diagram.



- Compute the reactions and draw Shear Force and Bending Moment diagrams for the beam shown in fig.2.



- Compute the reactions and using Integration Method draw Axial Force, Shear Force and Bending Moment diagrams for the beam shown in fig.3.

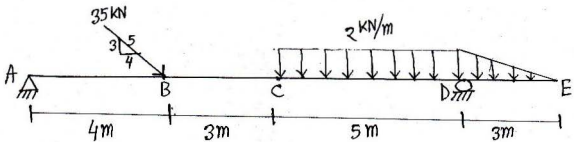


Fig.3

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2015 (Set A)**  
**Program: B.Sc. Engineering (Civil)**

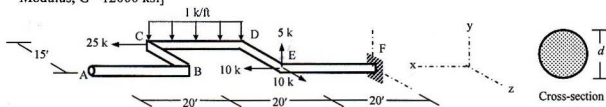


Course Title: Mechanics of Solids II  
 Time: 1 hour

Course Code: CE 213  
 Full Marks: 4x10=40

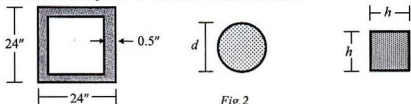
[Answer all the questions below]

1. Calculate the required diameter of  $d$  of uniform circular rod ABCDEF shown in *Fig.1* if the allowable torsional stress in it is 12 ksi and allowable torsional rotation is  $1^\circ$  [Given: Shear Modulus,  $G=12000$  ksi]



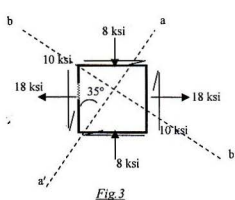
*Fig.1*

2. Calculate the maximum shear stresses in the sections shown below if they have equal cross-sectional area and are subjected to the same torsion 100 k-ft..

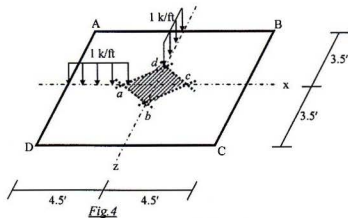


*Fig.2*

3. Use Mohr's circle to calculate the normal stress and shear stress on the plane a-a' and plane b-b' shown in the element below in *Fig.3*. Line a-a' and b-b' are perpendicular to each other.



*Fig.3*



*Fig.4*

4. The kern of the footing ABCD is represented by the shaded area shown in *Fig.4*. If the footing supports uniform live loads of  $1 \text{ k}'$  as shown along the x- and z-axis, calculate the normal stress at points A, B, C and D.

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2015 (Set 2)**



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

Course Title: Mechanics of Solids II  
 Time: 1 hour

- The normal stress and shear stress acting on a plane defined by  $\theta = 30^\circ$  on an infinitesimal element are  $\sigma_{xx}' = 100$  ksi and  $\tau_{xy}' = 50$  ksi.
  - Calculate the normal stress  $\sigma_{yy}$  and shear stress  $\tau_{xy}$  for this element, if  $\sigma_{xx} = 0$ .
  - Draw the Mohr's circle of stresses and show on it the stresses  $(\sigma_{xx}, \tau_{xy})$  and  $(\sigma_{xx}', \tau_{xy}')$ .

- The sections shown in Figs. 1(a), 1(b), 1(c) have equal cross-sectional area.

- Determine the values of  $d$  and  $D$ , and calculate

- $J_{eq}$  of each section
- Maximum shear stresses in the sections if subjected to the same torque (10 k-ft)

- Based on the results of (i), explain which of these sections is the most suitable for torsion.



Fig. 1(a)



Fig. 1(b)

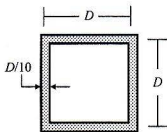
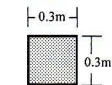


Fig. 1(c)

- For beam  $bcg$  of the frame  $abcdefghi$  loaded as shown in Fig. 2

- Draw the shear force and torque diagrams
- Calculate the maximum combined shear stress (for cross-section as shown).



All cross-sections

- For frame  $abcdefghi$  loaded as shown in Fig. 2, calculate the

- Reactions at spring  $ei$  and fixed support  $h$
- Combined maximum shear stress and deflection of the helical spring  $ei$
- Combined maximum normal stress at section  $h$  of the column  $ch$  (for cross-section as shown)

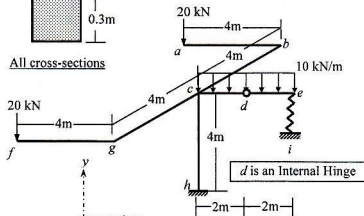


Fig. 2

[Given: Spring  $ei$  has mean diameter = 0.2m, coil diameter = 0.05m, number of coils = 6, shear modulus =  $80 \times 10^6$  kPa].



### 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	$J_{eq}$
Solid Circular	$\tau = Tc/J$	$\pi d^4/32$
Thin-walled	$\tau = T/(2A) t$	$4A^2/(ds/t)$
Rectangular	$\tau = T/(\alpha b t^3)$	$\beta b t^3$

b/t	1.0	1.5	2.0	3.0	6.0	10.0	$\infty$
$\alpha$	0.208	0.231	0.246	0.267	0.299	0.312	0.333
$\beta$	0.141	0.196	0.229	0.263	0.299	0.312	0.333

- \* Normal Stress (along x-axis) due to Biaxial Bending (about y- and z-axis):  $\sigma_x(y, z) = M_z y/I_z + M_y z/I_y$
- \* Normal Stress (along x-axis) due to Combined Axial Force (along x-axis) and Biaxial Bending (about y- and z-axis):  $\sigma_x(y, z) = P/A + M_z y/I_z + M_y z/I_y$
- \* 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  $k = Gd^4/(64R^3N)$
- \*  $\sigma_{xx}' = (\sigma_{xx} + \sigma_{yy})/2 + \{(\sigma_{xx} - \sigma_{yy})/2\} \cos 2\theta + (\tau_{xy}) \sin 2\theta = (\sigma_{xx} + \sigma_{yy})/2 + \sqrt{\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2} \cos(2\theta - \alpha)$
- \*  $\tau_{xy}' = -\{(\sigma_{xx} - \sigma_{yy})/2\} \sin 2\theta + (\tau_{xy}) \cos 2\theta = -\sqrt{\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2} \sin(2\theta - \alpha)$
- where  $\tan \alpha = 2 \tau_{xy}/(\sigma_{xx} - \sigma_{yy})$
- \*  $\sigma_{xx(max)} = (\sigma_{xx} + \sigma_{yy})/2 + \sqrt{\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2}$ ; when  $\theta = \alpha/2, \alpha/2 + 180^\circ$
- \*  $\sigma_{xx(min)} = (\sigma_{xx} + \sigma_{yy})/2 - \sqrt{\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2}$ ; when  $\theta = \alpha/2 \pm 90^\circ$
- \*  $\tau_{xy(max)} = \sqrt{\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2}$ ; when  $\theta = \alpha/2 - 45^\circ, \alpha/2 + 135^\circ$
- \*  $\tau_{xy(min)} = -\sqrt{\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2}$ ; when  $\theta = \alpha/2 + 45^\circ, \alpha/2 - 135^\circ$
- \* Mohr's Circle: Center  $(a, 0) = [(\sigma_{xx} + \sigma_{yy})/2, 0]$  and Radius  $R = \sqrt{\{(\sigma_{xx} - \sigma_{yy})/2\}^2 + (\tau_{xy})^2}$
- \* Maximum Normal Stress Theory (Rankine):  $|\sigma_1| \geq Y$ , or  $|\sigma_2| \geq Y$
- \* Maximum Normal Strain Theory (St. Venant):  $|\sigma_1 - \nu\sigma_2| \geq Y$ , or  $|\sigma_2 - \nu\sigma_1| \geq Y$
- \* Maximum Shear Stress Theory (Tresca):  $|\sigma_1 - \sigma_2| \geq Y$ ,  $|\sigma_1| \geq Y$ , or  $|\sigma_2| \geq Y$
- \* Maximum Distortion-Energy Theory (Von Mises):  $\sigma_1^2 + \sigma_2^2 - \sigma_1\sigma_2 = Y^2$

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid-Term Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Fluid mechanics  
Time: 1 hour

Course Code: CE 221  
Full Marks: 60

---

There are **four** questions. Answer any **three**.

1. (a) Briefly explain the application of fluid mechanics in Civil Engineering. [05]  
(b) A certain fluid weights 50 kN and occupies 6 m<sup>3</sup>. Determine unit weight and specific gravity of the fluid. [05]  
(d) A fluid is confined between two plates. Upper plate is moving and lower plate is at rest. Thickness of the fluid is 4 ~~mm~~<sup>ft</sup>. Velocity distribution of the fluid is expressed as  $V = 80 - k(4 - y)^2$  where y is distance from lower plate in feet and V is velocity in ft/s. Find velocity gradient and shear stress at upper and lower plate. The fluid has dynamic viscosity of 1.5 stoke and specific gravity of 1.25. [10]
2. (a) Prove that hydrostatic pressure at a point is same in all directions. [08]  
(b) A rectangular tank is shown in figure 2(b). The tank contains Kerosene which has a unit weight of 15 kN/m<sup>3</sup>. Determine [12]
  - i. Hydrostatic pressure at point A and P.
  - ii. Total hydrostatic force on ABCD and ABEF.
  - iii. Location of center of pressure of ABCD surface.
3. (a) What is Barometer? How does Barometer measure atmospheric pressure? [07]  
(b) Gage pressure of point A is 175 kN/m<sup>2</sup>. Find the absolute pressure of point B. Use the manometer reading shown in figure 3(b). [10]  
(c) Differentiate between cohesion and adhesion [03]
4. (a) What is flow net? Draw a typical flow net diagram [05]  
(b) Differentiate between [05]
  - i. Steady and Unsteady flow
  - ii. Uniform and Non-uniform flow  
(c) In a flow, the velocity vector is expressed by  $V = -4xi + 9yj - 2zk$ . Determine the equation of the streamline. Streamline passes through a point A (5, 4, 12). [10]

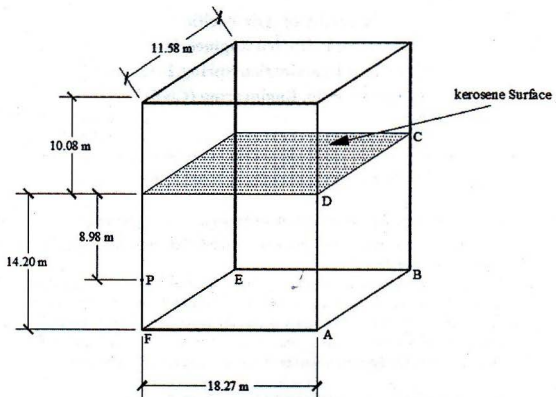


Figure 2(b)

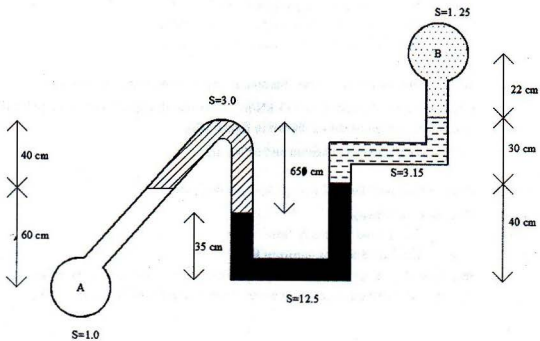


Figure 3(b)

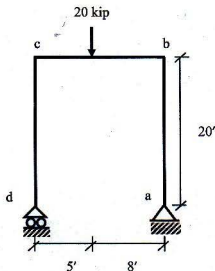
**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2015**  
**Program : B.Sc Engineering (Civil)**

Course Title: Structural Engineering I  
 Time : 1 hr

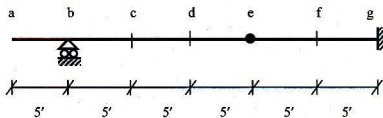
Course Code : CE 311  
 Full Marks : 40  
 3-1(A & B)

**(ANSWER ALL 3 QUESTIONS)**

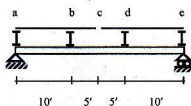
1. Draw AFD, SFD and BMD for all members of the following Frame (10)



2. Draw Influence Line of the following beam for:  
 (i)  $R_b$ ,  $R_g$  (ii)  $V_c$ ,  $V_{bR}$ ,  $V_f$  (iii)  $M_b$ ,  $M_d$ ,  $M_f$  (20)



3. For the Plate Girder shown, draw Influence Line for (i)  $FBR_a$  (ii)  $FBR_b$  (iii)  $V_{b-d}$  and (iv)  $M_c$  (10)

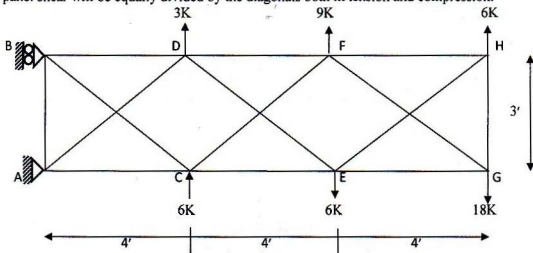


**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Fall 2014**  
**Program: B.Sc. Engineering (Civil)**

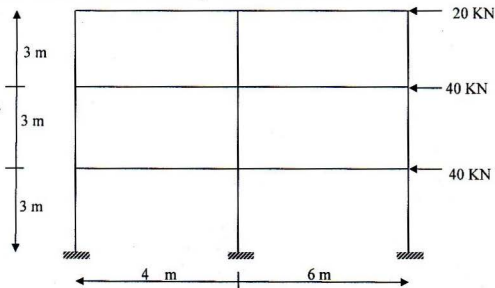
Course Title: Structural Engineering II  
 Time: 1 hr

Course Code: CE 313  
 Full Marks: 3x20=60

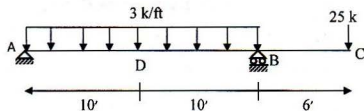
1. Calculate all member forces of the statically indeterminate truss shown below assuming that full panel shear will be equally divided by the diagonals both in tension and compression.



2. For the structure shown below, use the Portal Method to draw the AFD of the columns, SFD and BMD of the beams. Column areas are given beside the columns.



3. Calculate the deflection at point D (10 ft right from support A) of the beam shown below using virtual work method [Given  $E = 30,000$  ksi,  $I = 4,000$  in<sup>4</sup>].



**Integration of Product of Functions ( $I = \int f_1 f_2 dS$ )**

$f_2 \backslash f_1$					
	$AaL$	$BaL/2$	$AaL/2$	$(A+B)aL/2$	$[A+4C+B]aL/6$
	$AbL/2$	$BbL/3$	$AbL/6$	$[A+2B]bL/6$	$[2C+B]bL/6$
	$AaL/2$	$BaL/6$	$AaL/3$	$[2A+B]aL/6$	$[A+2C]aL/6$
	$A(a+b)L/2$	$B(a+2b)L/6$	$A(2a+b)L/6$	$[A(2a+b)+B(a+2b)]L/6$	$[Aa+Bb+2C(a+b)]L/6$

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid-Term Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Design of Concrete Structure I  
Time: 1 hour

Course Code: CE 315(A)  
Full Marks: 60

---

There are **four** questions. Answer any **three**.

1. (a) Mention different types of beam failure under flexure. Which type of failure is desirable and why? [05]  
(b) A rectangular column of 12"x16" has 8#7 bars. Determine the axial compressive load if steel undergoes a strain of 0.0004. Given that  $f_y = 40000$  psi and  $f'_c = 6000$  psi. [10]  
(c) Why minimum and maximum steel ratio is used for beam design? [05]
  
2. A beam is shown in figure 2. The beam contains a dead load of 1 k/ft excluding self weight and a live load of 1.5 k/ft. The beam has a cross section of 12"x24" and a span of 25 feet. The bending moment diagram of the beam is also shown in figure 2. Determine the flexure requirement for maximum negative moment. Follow USD or WSD method. Given that  $f_y = 60000$  psi,  $f'_c = 6000$  psi,  $f_{call} = 2.25$  ksi,  $f_{fall} = 24$  ksi. [20]
  
3. (a) A rectangular beam has a dimension of 12"x28". It contains tension reinforcement consists of 6#10 in two rows (cover 4"). Compression reinforcement consists of 2#8 bars is placed 2.5" from the compression face of the beam. If  $f_y = 60000$  psi and  $f'_c = 5000$  psi, what is the design moment capacity of the beam? [15]  
(b) What will be the load factor according to ACI for following loads [05]
  - i. Self weight
  - ii. Partition wall load
  - iii. Wind load
  - iv. Equipment load
  - v. Earthquake load
  
4. (a) Find the value of uniformly distributed load on the cantilever beam shown in figure 4(a) which will produce first crack at the top fiber of the support section. The beam has a dimension of 10"x20" and it contains 3#7 bars. Given that  $f_y = 40000$  psi and  $f'_c = 6000$ . Assume a cover of 2.5". [15]  
(b) Differentiate between USD and WSD method. [05]

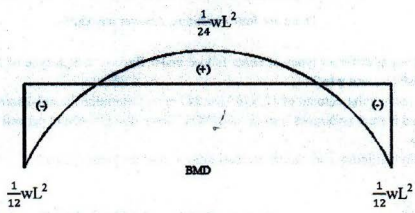
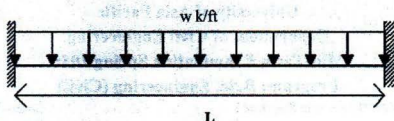


Figure 2

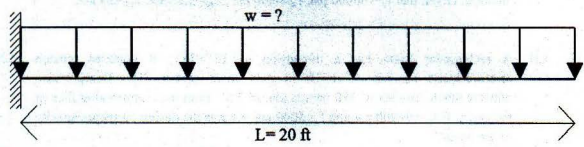


Figure 4(a)



Formula

$$P = A_c f_c + A_s f_s$$

$$P = f_c \{ A_g + (n-1) A_s \}$$

$$P = 0.85 f'_c A_c + A_s f_y$$

$$P = A_c f_{ct} + A_s f_s$$

$$P = A_s f_y$$

$$E_c = 57000 \sqrt{f'_c}$$

$$f_r = 7.5 \sqrt{f'_c}$$

$$M_c = 0.5 k j b d^2 f'_c$$

$$M_s = A_s f_s j d$$

$$k = -\rho n + \sqrt{\{(2\rho n + (\rho n)^2)\}}$$

$$j = 1 - k/3$$

$$\rho_b = \frac{\alpha f'_c}{f_y} \frac{\epsilon_u}{\epsilon_u + \epsilon_y}$$

$$\rho_{max} = \frac{\alpha f'_c}{f_y} \frac{\epsilon_u}{\epsilon_u + \epsilon_t}$$

$$M_n = A_s f_y (d - \frac{a}{2})$$

$$M_n = \rho f_y b d^2 (1 - 0.59 \rho \frac{f_y}{f'_c})$$

$$\gamma f'_c a b = A_s f_y$$

$$\rho_{min} = \frac{1.8 \sqrt{f'_c}}{f_y} \geq \frac{200}{f_y}$$

$$\epsilon_t = \frac{-c + d_t}{c} \epsilon_u$$

$$M_{1n} = A'_s f_y (d - d')$$

$$M_{2n} = (A_s - A'_s) f_y (d - \frac{a}{2})$$

$$0.85 f'_c a b = (A_s - A'_s) f_y$$

$$\bar{\rho}_{max} = \rho_{max} + \rho'$$

$$\bar{\rho}_{cy} = \gamma \beta_1 \frac{d'}{a} \frac{f'_c}{f_y} \frac{\epsilon_u}{\epsilon_u - \epsilon_y} + \rho'$$

$$f'_s = \epsilon_u E_s \frac{c - d'}{c}$$

$$\Phi = 0.483 + 83.3 \epsilon_s$$

Table 1 Bar diameter and area of bar

$d$ (No.)	2	3	4	5	6	7	8	9	10
$A_s$ (in <sup>2</sup> )	0.05	0.11	0.20	0.31	0.44	0.60	0.79	1.00	1.27
$d$ (mm)	8	10	12	16	19	22	25	28	31
$A_s$ (in <sup>2</sup> )	0.08	0.12	0.18	0.31	0.44	0.59	0.76	0.95	1.17

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Design of Concrete Structures I  
 Time: 1 hr

Course Code: CE 315 (B)  
 Full Marks: 2x10=20

[Answer all the questions]

1.a) Show the variation of stress and stress of rectangular RC section subjected to increasing positive moments, demonstrating Un-cracked, cracked elastic and cracked inelastic section? (3)

1.b) For a beam section (with beam width  $b = 14''$ ) subject to applied ultimate moment  $M_u = 120$  k-ft, calculate (i) Minimum depth of the section and steel area assuming steel ratio to be equal to  $\rho_{max}$

(ii) Steel reinforcement if the beam height ( $h$ ) is fixed at 20''

[Given:  $f'_c = 4$  ksi,  $f_y = 55$  ksi].

$M_n = M_u/0.9$ ;  $f'_c = 4$  ksi,  $f_y = 60$  ksi,  $\alpha = 0.72$ ,

$\rho_b = (\alpha f'_c / f_y) \{87 / (87 + f_y)\}$ ,  $\rho_{max} = 0.75 \rho_b$ ,  $a = d [1 - \sqrt{1 - 2 M_n / (f_c b d^2)}]$ ,  $f_c = 0.85 f'_c$

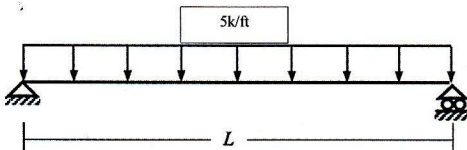
$M_n = \rho_d f_y (1 - 0.59 \rho_d f_y / f'_c) b d^2$ ,  $A_s = M_n / \{f_y (d - a/2)\}$ ,  $a = A_s f_y / (0.85 f'_c b)$

2.a) Why doubly reinforced beam is more practical than singly reinforced beam in WSD method. (3)

2.b) Use the WSD Method to design the simply supported singly reinforced RC beams shown below, including their self-weights and assuming (7)

(ii)  $L = 25'$  [Given:  $f'_c = 4.5$  ksi,  $f_{call} = 1.80$  ksi,  $f_{sall} = 24$  ksi, assume  $b = 15$  inch]

Use Formula  $A_s = M_{max} / (f_{sall} j d)$ ;  $M_{max} = 0.5 f_{call} k j b d^2$



**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Design of Concrete Structures II  
 Time: 1 hr

Course Code: CE 317 (A-section)  
 Full Marks: 3x15=45

[Answer all the questions. Assume value for any missing data]

1. a) Why ties are provided in columns? Write down the rules for placing ties in tied columns according to ACI. (5)

b) Use WSD to design the following slab system shown in Fig. 1, supported by 12"x12" beam all around and 12"x12" column. Calculate the required reinforcements and show them in neat sketches (draw plan showing the reinforcements) [Given, FF = 35 psf, PW = 45 psf, LL = 90 psf,  $f'_c = 3$  ksi and  $f_y = 60$  ksi,  $f_s = 24$  ksi,  $n = 9$ ,  $k = 0.378$ ,  $j = 0.874$ ]. (10)

$$\begin{array}{lll}
 +C_{A(DL)} = 0.027, & +C_{A(LL)} = 0.032, & -C_A = 0.071 \\
 +C_{B(DL)} = 0.033, & +C_{B(LL)} = 0.035, & -C_B = 0.00
 \end{array}$$

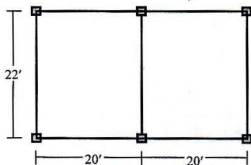


Fig. 1

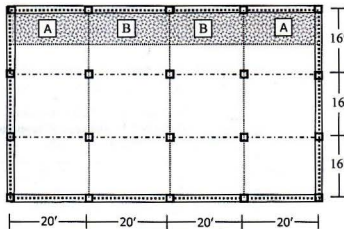


Fig. 2

2. A building is to be designed as a flat plate structure. A plan of the building (supported on 12"X10" edge beams) is shown in Fig 2. All columns are 12"X12". Use WSD to calculate the column strip and middle strip moments and reinforcements of Panel A [Given,  $\alpha_1 = 3.7$  and  $\beta_1 = 1.8$ , FF = 25 psf, RW = 30 psf, LL = 50 psf,  $f'_c = 4$  ksi,  $f_y = 60$  ksi,  $k = 0.375$ ,  $j = 0.875$  and  $f_s = 24$  ksi]. (15)
3. Design the corner column C<sub>4</sub> shown in Fig 3 using USD method. (15)  
 Given: LL on floor = 40 psf, LL on roof = 40 psf RW on floor = 20 psf, FF = 20 psf, Lime Concrete(LC) on roof = 25 psf, No. of storey = 3 and Height of each storey = 10'. The slab panel (15' x 24' c/c) contains no beams and all columns are of size 18" x 18", Slab thickness = 5", Thickness of Exterior wall is 10",  $f'_c = 3$  ksi,  $f_y = 40$  ksi,  $f_{s,all} = 18$  ksi.

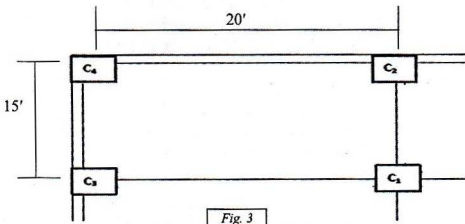


Fig. 3

### List of Useful Formulae for CE 317

#### Two way Slab

$$*M_A = C_A \times W_T \times A^2, \quad *-M_B = C_B \times W_T \times B^2$$

$$*+M_A = C_{A(DL)} \times W_{DL} \times A^2 + C_{A(LL)} \times W_{LL} \times A^2, \quad *+M_B = C_{B(DL)} \times W_{DL} \times B^2 + C_{B(LL)} \times W_{LL} \times B^2 \quad *A_3 = M/f_y d$$

#### Column-Supported Slabs

\*Total Static Moment at Factored Loads,  $M_0 = w_n L_2 L_n^2/8$

\*Total static moment for interior spans:  $M_1^{(-)} = 0.65 M_0, M_u^{(+)} = 0.35 M_0$

\*Distribution Factors applied to Static Moment  $M_0$  for Positive and Negative Moments

Position of Moment	Ext Edge unrestrained (a)	Slab with beams between all supports (b)	No beam between interior supports		Exterior Edge fully restrained (e)
			Without edge beam (c)	With edge beam (d)	
Exterior $M^{(-)}$	0.00	0.16	0.26	0.30	0.65
Interior $M^{(-)}$	0.75	0.70	0.70	0.70	0.65
$M^{(+)}$	0.63	0.57	0.52	0.50	0.36

$$* \alpha = E_{cs} I_y / E_{cs} I_x \quad * \beta_1 = E_{cs} C / 2 E_{cs} I_x \quad * C = \sum (1 - 0.63 x/y) x^2 y / 3$$

$$\% \text{ of Exterior } M^{(-)} \text{ supported by Column Strip} = 100 - 10\beta_1 + 12\beta_1 (\alpha_1 L_2/L_1) (1 - L_2/L_1)$$

$$\% \text{ of } M^{(+)} \text{ supported by Column Strip} = 60 + 30 (\alpha_1 L_2/L_1) (1.5 - L_2/L_1)$$

$$\% \text{ of Interior } M^{(-)} \text{ supported by Column Strip} = 75 + 30 (\alpha_1 L_2/L_1) (1 - L_2/L_1)$$

$$*A_x = (V_n - V_c) / (f_y \sin \alpha) \quad *S = A_x f_c d / (V - V_c)$$

$$*V_c = 4 \sqrt{f_c} b_o d \quad *V_c = (2 + 4/\beta_1) \sqrt{f_c} b_o d \quad *V_c = (2 + \alpha_x d/b_o) \sqrt{f_c} b_o d \quad [\text{Use half of the values for WSD}]$$

$$*V_c = 1.1 \sqrt{f_c} b_o d$$

#### Short Column

$$*P_n = 0.85 f_c' A_g + f_y A_s = A_g [0.85 f_c' + \rho_s (f_y - 0.85 f_c')]$$

$$*P_o = \alpha \phi A_g [0.85 f_c' + \rho_s (f_y - 0.85 f_c')]$$

$$*P_{ult} = \phi' (0.25 f_c' A_g + f_{sult} A_s) = \phi' A_g [0.25 f_c' + \rho_s f_{sult}]$$

$$*\rho_s = 0.45 (A_g/A_{core} - 1) (f_c'/f_y) \quad *S = 4 A_{sp} / (\rho_s d_{core})$$

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2015**  
**Program: B. Sc. Engineering (Civil)**

Course Title: Environmental Engineering I

Course Code: CE 331

Time- 1 hour

Full marks: 50

There are **THREE** questions. Question 1 is mandatory. In addition, answer any **ONE** between questions 2 and 3. ( $25 \times 2 = 50$ )

1. (a) The table below shows the properties of four types of soil; Mention which type of (6) soil is capable of retaining most of the water and which one is capable of discharging most of the water; also calculate the maximum amounts retained and discharged respectively if the aquifer bearing the soil layer has a total volume of 1000 m<sup>3</sup>.

Soil type	Porosity ( % )	Specific yield ( % )
Clay	45	3
Gravel and sand	20	16
Sand	35	25
Gravel	25	22

- (b) How can an operator tell when to backwash a filter and how can it be done? (3+6) Show the flow charts of water treatment systems (showing the treatment components) that will need to treat the water collected from two different rivers with following characteristics:

Parameters	River A	River B
Suspended matter	High	Low
Turbidity	High	Low

- (c) Compare corrosive water and scale forming water (both with Bayliss curve and mentioning the characteristics). What are the common problems in water conveyance system? (6+4)

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Environmental Engineering II  
 Time- 1 hour

Course Code: CE 333  
 Full marks: 30

Answer all of the questions below  
Assume reasonable value for any missing data (if applicable)

1. (a) Write the advantages and disadvantages of the ROEC latrine. (4)
- (b) Design leach pits for both single and alternating twin off-set pit pour-flush latrines serving a family of seven members living in a sub-urban area. Wastewater flow is 25 lpcd and the soil is sandy loam. [ $A_i = Q / I$ ,  $V_i = Q D / 4I$ ,  $V_s = C \times P \times N$ ] (8)
2. (a) In a 8 unit apartment building, 30 residents are generating an average wastewater flow of 180 lpcd. Design a double chamber septic tank for the building that will be desludged at every 2 years. For ensuring better effluent quality, it is recommended that the minimum hydraulic retention time for the tank be 1.0 day. Due to space constraints, specific tank area has to be restricted within 12 m<sup>2</sup>. Assume wastewater temperature within the tank to be 25°C. Check clear space depth. Draw a net sketch showing details of septic tank dimensions and depth of different zones. (11)
3. (a) Define – (i) Self cleansing velocity (2)
- (ii) Unconfined sanitation system
- (b) Using the Hydraulic elements diagram, given in Fig.1, Estimate the allowable discharge and flow velocity in the sewer having a diameter of 16 inch, flowing 2/5th of full depth. With,  $n=0.013$  and slope = 0.015. (5)

**Table 1: Design Values for Long-term Infiltration Rates for Wastewater into Various Soils**

Soil Type	Long term infiltration rate, I (l/m <sup>2</sup> -day)
Sand	50
Sandy loam	30
Porous loam, porous silty clay loam	20
Compact silty loam, clay	10

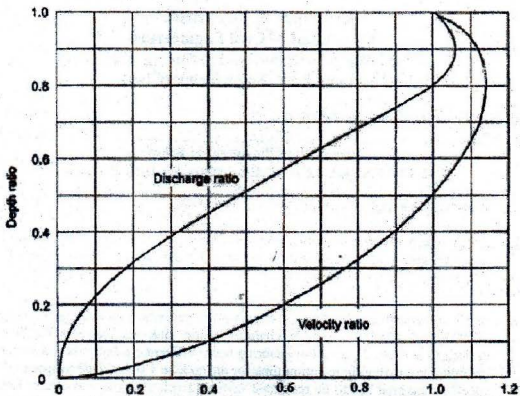


Figure-1: Hydraulic elements diagram

University of Asia Pacific  
 Department of Civil Engineering  
 MidTerm Examination  
 Spring 2015  
 Program: B.Sc. Engineering (Civil)

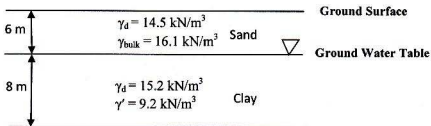
Course Title: Geotechnical Engineering I  
 Time: 1 hour

Course Code: CE 341  
 Full Marks: 20

Answer all the questions.

(4x5=20 marks)

1. a) Classify the following soil. The properties of the subgrade soil are found as follows. 3  
 Percent finer than 0.075 mm = 55%  
 Percent finer than 0.425 mm = 60%  
 Percent finer than 0.6 mm = 62%  
 Percent finer than 4.75 mm = 75%  
 Liquid limit = 52%  
 Plastic limit = 35%
- b) What are the effective size, uniformity coefficient and coefficient of curvature for the given soil?  
 Given that, percent of material coarser than 0.075 mm = 90%; percent finer than 0.425 mm = 31%; percent finer than 0.6 mm = 30%; percent finer than 4.75 mm = 60%. 2
2. Calculate the compression index for the given saturated clay soil (normally consolidated). The stress on the soil is increased from 350 to 680 kPa. Given that, void ratio under 250 kPa effective stress is found 0.55. The void ratio is found 0.44 under 680 kPa of effective stress. Later the sample is unloaded from 680 kPa to 250 kPa. Draw the e-log $\sigma'$  curve. Calculate overconsolidation ratio for the following cases: 5  
 (i) when the stress on the soil was 350 kPa during loading path;  
 (ii) when the stress on the soil was 350 kPa during unloading path;  
 (iii) when the stress on the soil was 450 kPa during loading path.  
 (iv) when the stress on the soil was 450 kPa during unloading path.
3. a) Derive the expression of estimating primary consolidation settlement for normally consolidated clay. 4  
 b) Write the expression including coefficient of consolidation, time, Time factor and drainage path ( $H_{dr}$ ). 1
4. (a) Calculate the total stress, effective stress and pore water pressure at the top and the middle of the saturated clay layer. (Fig 1). 3  
 (b) Sketch the soil profiles demonstrating one way drainage and both way drainage for primary consolidation settlement.





**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Transportation Engineering I (Transport and Traffic Design)  
 Time: 1 Hour

Course Code: CE 351  
 Full Marks: 20

There are **three** questions. Answer two of them

1. a) The following spot speeds (km/hr) were observed for 30 vehicles traversing a segment of a highway. 9  
 45, 33, 48, 53, 55, 60, 56, 48, 72, 42, 44, 43, 35, 47, 44, 57, 52, 56, 68, 64, 35, 38, 42, 28, 48, 38, 34, 43, 35, 65.  
 Calculate the design speed, average speed, safe speed, median speed and lower limit of speed.
- b) What is PIEV time? 1
2. a) Design a two-phase signal of a cross-junction for the data given below: 8
- |           |       |
|-----------|-------|
| Amber     | 3 sec |
| Red-amber | 2 sec |
- 
- |             |     |     |
|-------------|-----|-----|
|             | N-S | E-W |
| Inter green | 8   | 7   |
| Lost time   | 3   | 2   |
- 
- |                        |            |       |      |      |
|------------------------|------------|-------|------|------|
|                        | Approaches |       |      |      |
|                        | North      | South | East | West |
| Flow, veh/hr           | 830        | 780   | 820  | 780  |
| Saturation flow veh/hr | 2340       | 2160  | 2460 | 2610 |
- Draw the phase diagram.
- b) Briefly describe mandatory traffic sign. 2
3. a) What is the objective of traffic volume study? 4  
 b) What are the dynamic characteristics of vehicles that affect the road design? 3  
 c) List some pedestrian crossing behaviors in Dhaka city (at least three). 3

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Open Channel flow  
Time: 1 Hour

Course Code: CE 361  
Full Marks: 80

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All notations have their usual meaning. Assume any reasonable data, if not given

**Answer all the Questions**

1. (a) Flow cannot be uniform in frictionless channel. Briefly discuss. (05)  
(b) For a triangular channel with  $s=2$ , compute the critical depth and velocity if  $Q=14 \text{ m}^3/\text{s}$  and  $\alpha=1$ . (Use Bisection method) (15)
2. (a) Prove that in a critical flow Froude number is equal to unity. (05)  
(b) A circular channel with 2.75 m in diameter carries a discharge of  $6.55 \text{ m}^3/\text{s}$  at a depth of 1.1 m. Determine the state of flow. (15)
3. (a) Write down the classification of open channel flow. (04)  
(b) In a wide channel velocity varies along a vertical as  $u = 4(z/h)^{1/2}$  where  $h$  is the total depth and  $u$  is the velocity at a distance  $z$  from the channel bottom. Calculate the depth average velocity ( $U$ ) and energy co-efficient ( $\alpha$ ) if the total depth is 10 m. (16)
4. (a) Write short notes on Momentum equation. (04)  
(b) Prove that hydraulic exponent for critical flow computation for a triangular section is 5. (08)  
(c) Compute the critical depth and velocity in a triangular channel with  $s=2$  and  $Q=10 \text{ m}^3/\text{s}$ . Assume  $\alpha=1.12$ . (Use Analytical method) (08)

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2015**

Course # : CE 363  
Full Marks: 60

Course Title: Engineering Hydrology  
Time: 1 hour

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**Answer all Questions**

1. Mention different types of Storms. What is precipitable water? How is it calculated? (4 + 1+ 2) = (7)
2. Describe different forms of precipitation. How is adequacy of rain gauge stations checked? (6 + 5) = (11)
3. Write short notes on (any four): (3\*4) = (12)
  - i. Dalton's law of evaporation
  - ii. PET and AET
  - iii. Water-Budget method
  - iv. Interception losses
  - v.  $\Phi$ - index

4. Why pan co-efficient is introduced to calculate evaporation using different evaporation pan? (6)

5. For a drainage basin of 241 km<sup>2</sup>, isohyets drawn for a storm gave the following data: (10)

---

Isohyets interval	59-39	49-29	39-19	29-19
(cm)				
Inter isohyetal area	80	31	55	28
(km <sup>2</sup> )				

---

Estimate the average depth of precipitation over the catchment.

6. There were 6 rain gauge stations namely A, B, C, D, E, F where station E was inoperative for the month. At that month rainfall recorded in the other five stations were 3.6, 7.0, 10.4, 5.8, 9.2 cm respectively. If the average annual rainfalls for the stations are 83, 68, 94, 70, 96 and 72 cm. Estimate the rainfall at station E. (10)
7. Estimate the daily potential evapotranspiration for the following data by Penman's formula: (5)
  - i. Slope of the saturation vapor pressure vs. temperature at the mean air temperature = 1.00 mm/<sup>o</sup>C
  - ii. Mean temperature = 19<sup>o</sup>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/<sup>o</sup>C

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Project Planning and Management  
Time: 1 hour

Course Code: CE401  
Full Marks: 20

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Answer All Questions

- 1(a) What is meant by management? What things do you need to manage in a project? 1  
(b) Why is construction management a complex and challenging discipline? Pls Explain. 1
- 2(a) What is meant by Planning? Why Planning is important? 1  
(b) What do you understand by WBS? What are the benefits of doing WBS? 1
- 3(a) What is a Project? Define the characteristics of a project. 1  
(b) Give examples (at least two) of positive and negative stakeholders of a project. 1  
(c) Draw Project life cycle and briefly describe each phase 2  
(d) In your judgment, which is the most important phase of Project life cycle? Why? 1
- 4(a) Write down the differences between CPM and PERT? 2  
(b) Describe briefly the drawbacks of Gantt Chart. 1  
(c) What are the benefits of Network Diagram? 1  
Draw the network diagram. Find the total duration and critical path of a project from the following information: 4

Activity	Predecessor	Duration (mins)
Make Menu	-	30
Shop for ingredients	Make Menu	60
Prepare ingredients	Shop for ingredients	60
Prepare Appetizers	Shop for ingredients	60
Cook Food	Prepare ingredients	30
Wash Tableware	Make Menu	45
Set Table	Wash Tableware	15
Serve Dinner	Set Table, Cook Food, Prepare Appetizers	0

- 5(a) What is meant by Contract? 1  
(b) Write down the legal elements of contract. 1  
(c) Write down the documents that form a contract. 1

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Professional Practices and Communication  
Time: 1 Hour

Course Code: CE 403  
Full Marks: 20

Answer all questions.

- 1 Read the following passage and give answer with explanation from Engineering ethical point of view: 6

Dr Peter Gilmore works for BG Chemicals Ltd and is based at their plant in Leicestershire. He is sent to France for 6 months to liaise with Monsieur Loreau at the Douai site concerning a project to develop and produce marine lubricants. Peter rents a flat in a nearby village and is given a desk in Mr Loreau's office so that he can work comfortably. He is made to feel very welcome, with everyone being forgiving of his weak grasp of the beloved French language. It takes a couple of weeks to settle in properly but soon Peter is chatting in French that, whilst not fluent, is certainly understood by his colleagues. He is working closely with Mr Loreau and the project is progressing well, with completion due well within schedule.

Feeling more at home, Peter has started to explore around the office during his lunchtime, and on one of his walks finds a charming little bistro, tucked away down a side street. He decides to try their *menu du jour* and is ushered to a table near the back. He glances over to the table next to his and sees faces that he recognises- he does not know their names to but he has seen the three men working on the factory floor. They look to be halfway through their lunch and there are already two empty bottles of wine on their table. As Peter enjoys his meal he observes that the Frenchmen polish off another bottle of wine before they leave the bistro and return to work.

Concerned, Peter approaches Mr Loreau when he returns to the office and tells him of the large amount of alcohol that he has seen some of the workers consuming before returning to deal with poisonous and corrosive chemicals as well as heavy machinery. Mr Loreau shrugs, and says that this is quite normal. The French tend to enjoy a leisurely lunch with free-flowing wine but this is always accompanied by a hearty meal. Plus, the men do this every day so alcohol does not affect them as it would someone less used to drinking regularly. Mr Loreau tells Peter that he is not to worry; wine is even served at the factory canteen for those that wish to stay in for their lunch.

- (i) Why is Dr Gilmore concerned? Are his concerns justified? Why/ why not?  
(ii) Was Dr Gilmore right to take his concerns to Mr Loreau?  
(iii) What should Dr Gilmore do next? Why?
- (b) Briefly describe the key points of IEEE code of ethics. 1.5
- 2(a) Write down briefly about three models of responsibility. 1.5  
(b) Mention the ways that cause harm. 1  
(c) Briefly describe (at least three) the impediments of responsibility 1
- 3(a) What are the barriers of effective communication? Mention with a diagram. 1.5  
(b) What affects (mention at least five) communication? 1.5

(c) Pls explain from the following figure, which is the most powerful sense? Why?

1



(d) What do you mean by body language? Pls explain.

2

4(a) What should not you do in your presentation? Pls explain (at least five).

1.5

(b) What things you remember for planning your presentation

1.5

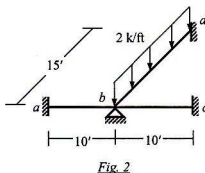
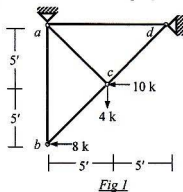
**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2015 (Set B)**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Structural Engineering III  
 Time: 1 hour

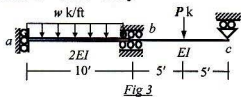
Course Code: CE 411  
 Full Marks: 4x10=40

[Answer all the questions below]

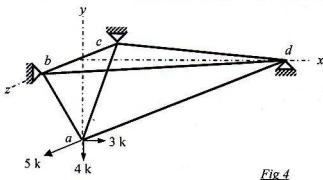
1. For the truss shown below in *Fig. 1*, ignore the zero-force members and apply the boundary conditions to determine the unknown horizontal and vertical deflections [Given:  $EA/L = 1000$  kip/ft].



2. Use stiffness matrix to calculate the unknown rotations at joint *b* for the grid shown in *Fig. 2* [Given:  $EI = 40 \times 10^3$  k-ft<sup>2</sup>,  $GJ = 30 \times 10^3$  k-ft<sup>2</sup>].
3. For the beam shown in *Fig. 3*, apply boundary conditions and neglect axial deformation to determine the uniformly distributed load  $w$  k/ft and concentrated load  $P$  k, when the vertical displacement of joint *a*  $7.813 \times 10^{-3}$  ft (downward) and the rotation of joint *c* is  $2.344 \times 10^{-4}$  rad (counterclockwise) [Given:  $EI = 40 \times 10^3$  k-ft<sup>2</sup>].



4. In the three-dimensional truss shown in *Fig. 4*, apply boundary conditions to determine the unknown joint displacements [Given:  $EA/L = 500$  kip/ft].



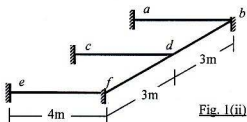
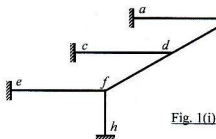
Nodal Coordinates (ft): $a(0, -6, 0)$ , $b(0, 0, 3)$ , $c(0, 0, -3)$ , $d(12, 0, 0)$
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**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2015 (Set B2)**

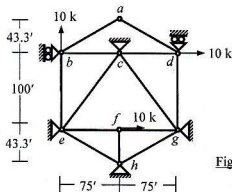
Course #: CE 411  
 Full Marks: 40 (= 4 × 10)

Course Title: Structural Engineering III  
 Time: 1 hour

1. (i) Determine the degree of kinematic indeterminacy (doki) of 3D frame *abcdefgh* shown in Fig. 1(i), considering boundary conditions and neglecting axial deformations.
- (ii) Formulate stiffness matrix of the grid *abcdef* shown in Fig. 1(ii), using boundary conditions and considering symmetry about x-axis; i.e., only considering  $u_x$  and  $\theta_z$  at *d* [Given:  $EI = 25 \times 10^3 \text{ kN-m}^2$ ,  $GJ = 20 \times 10^3 \text{ kN-m}^2$ ].



2.



For the truss *abcdefgh* loaded as shown in Fig. 2, use the Stiffness Method to calculate the

- (i) Deflections at joints *b*, *d* and *f*  
 (ii) Force in members *ef* and *fg*

[Given:  $S_x = \text{constant} = 500 \text{ kip/ft}$ ].

3. For the frame *abcde* shown in Fig. 3

- (i) Determine the size of stiffness matrix (considering boundary conditions also) if axial deformations are neglected.
- (ii) Use the Stiffness Method (neglecting axial deformations) to calculate the bending moments at joint *a*, *b* and *c* if the frame is loaded as shown

[Given:  $EI = \text{constant} = 40,000 \text{ k-ft}^2$ ].

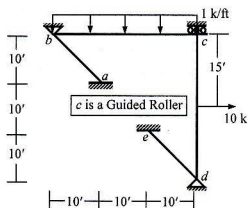


Fig. 3

4. Use Stiffness Method to calculate the forces in all members of the truss *abcdef* loaded as shown in Fig. 4 (with nodal coordinates)

[Given:  $S_x = \text{constant} = 7500 \text{ kN/m}$ ].

Nodal Coordinates (m)	
<i>a</i>	(0, 0, 0)
<i>b</i>	(14, 0, 0)
<i>c</i>	(0, 0, 7)
<i>d</i>	(14, 0, 7)
<i>e</i>	(0, -7, 0)
<i>f</i>	(14, -7, 0)

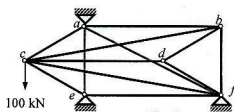


Fig. 4



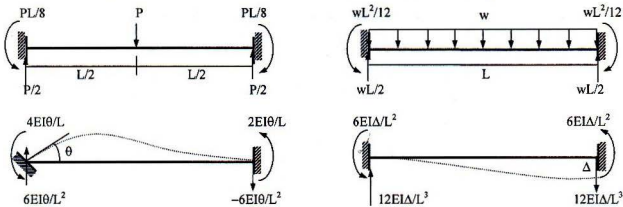
### List of Useful Formulae for CE 411

\* The stiffness matrix  $K_m^G$  of a 2D truss member in the global axis system is given by

$$K_m^G = S_x \begin{pmatrix} C^2 & CS & -C^2 & -CS \\ CS & S^2 & -CS & -S^2 \\ -C^2 & -CS & C^2 & CS \\ -CS & -S^2 & CS & S^2 \end{pmatrix} \quad \text{and Truss member force, } P_{AB} = S_x [(u_B - u_A) C + (v_B - v_A) S]$$

[where  $C = \cos \theta$ ,  $S = \sin \theta$ ]

\* Fixed End Reactions for One-dimensional Prismatic Members under Typical Loadings



\* Ignoring axial deformations, the matrices  $K_m^L$  and  $G_m^L$  of a frame member in the local axis system are

$$K_m^L = \begin{pmatrix} S_1 & S_2 & -S_1 & S_2 \\ S_2 & S_3 & -S_2 & S_4 \\ -S_1 & -S_2 & S_1 & -S_2 \\ S_2 & S_4 & -S_2 & S_3 \end{pmatrix}$$

$$\text{where } S_1 = 12EI/L^3, S_2 = 6EI/L^2, S_3 = 4EI/L, S_4 = 2EI/L$$

\* The stiffness matrix of a 3D truss member in the global axes system [using  $C_x = \cos \alpha$ ,  $C_y = \cos \beta$ ,  $C_z = \cos \gamma$ ] is

$$K_m^G = S_x \begin{pmatrix} C_x^2 & C_x C_y & C_x C_z & -C_x^2 & -C_x C_y & -C_x C_z \\ C_y C_x & C_y^2 & C_y C_z & -C_y C_x & -C_y^2 & -C_y C_z \\ C_z C_x & C_z C_y & C_z^2 & -C_z C_x & -C_z C_y & -C_z^2 \\ -C_x^2 & -C_x C_y & -C_x C_z & C_x^2 & C_x C_y & C_x C_z \\ -C_y C_x & -C_y^2 & -C_y C_z & C_y C_x & C_y^2 & C_y C_z \\ -C_z C_x & -C_z C_y & -C_z^2 & C_z C_x & C_z C_y & C_z^2 \end{pmatrix}$$

\* Direction cosines of 3D truss member  $C_x = L_x/L$ ,  $C_y = L_y/L$ ,  $C_z = L_z/L$ ; where  $L = \sqrt{L_x^2 + L_y^2 + L_z^2}$

\* Member force  $P_{AB} = S_x [(u_B - u_A) C_x + (v_B - v_A) C_y + (w_B - w_A) C_z]$

\* Torsional stiffness =  $GJ/L$

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Structural engineering V (Prestressed Concrete)  
Time: 1 hr

Course Code: CE 415  
Full Marks: 60

[There are four questions and answer any three from the following questions. Assume value for any missing data]

1. A straight pretensioned concrete member has a span of 15m with a section of 350 mm by 580 mm (Fig: 1). It is eccentrically prestressed with 620 mm<sup>2</sup> of steel which is anchored to the bulkheads at a stress of 1035 MPa. The c.g.s. is 100 mm above the bottom fiber. Assuming  $n=7$ , compute the loss of prestress due to elastic shortening of concrete at the transfer of prestress. (20)

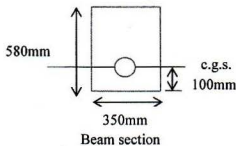


Fig: 1

2. (a) A pretensioned concrete rectangular beam 400 mm by 450 mm has a simple span of 14 m and it is concentrically prestressed with 750 mm<sup>2</sup> of high-tensile steel which is anchored to the bulkheads of a unit stress of 1300 MPa. If  $E_{ci}=33000$  MPa and  $E_s=200000$  MPa, Compute the stresses in the concrete and steel immediately after transfer using both Exact and Approximate solution. (13)
- (b) What are the differences between Prestressed concrete and Reinforced concrete? (7)
3. (a) Briefly describe about the stages of loading. (7)
- (b) A prestressed-concrete rectangular beam 450mm×600mm has a simple span of 16m and is loaded by a uniform load of 25 KN/m including its own weight as shown below. The prestressing tendon is located as shown in the figure and it produces an effective prestress of 1400 KN. Using the Load balancing method find out the fiber stresses. (13)

4. (a) A prestressed-concrete beam is continuous over two spans, as shown in Fig: 2 and its curved cable is to be tensioned from both ends. The coefficient of friction is 0.30 and the length effect is  $K=0.0026$  per meter. Compute the percentage loss due to friction of the entire beam by exact method. (13)

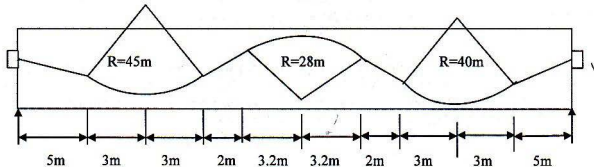


Fig: 2

- (b) Name different types of losses of prestress concrete and briefly describe any two of them. (7)

**Required Formulae**

- ❖  $f_c = -(F/A) \pm (Fey/I) \pm (My/I)$
- ❖  $f_c = -(F/A) \pm (M_o y/I)$
- ❖  $\Delta f_s = n [-(F/A) \pm (Fe^2/I) \pm (Me/I)]$
- ❖  $\Delta f_s = n f_c = n [F/(A_c + nA_s)]$
- ❖  $(F_1 - F_2)/F_1 = -\mu\alpha - kL$
- ❖  $F_2 = F_1 e^{-\mu\alpha - kL}$

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Structural Engineering VI (Design of Steel Structures)  
Time: 01 Hour

Course Code: CE 417  
Full Marks: 60

There are Four questions. Answer any Three

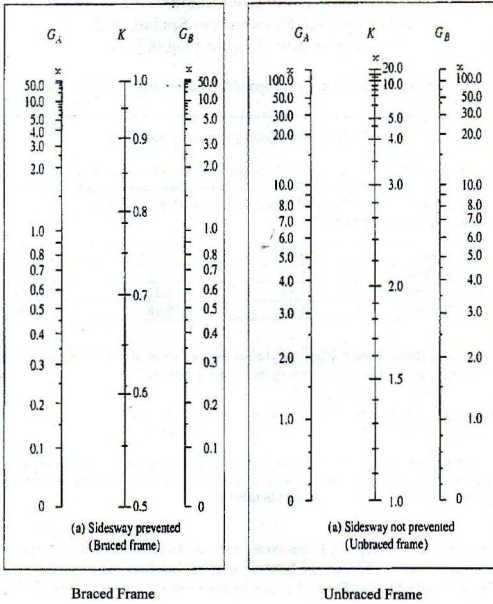
1. (a) Select the lightest W section of A36 steel for a column of 20 ft to carry an axial compression load of 80 kip dead load and 100 kip live load in a braced frame structure. Member is assumed fixed-pinned in both axes. Use AISC-ASD method. Possible sections are given below.

Size	$A_g$ (in <sup>2</sup> )	$r_x$ (in)	$r_y$ (in)
W 12×40	11.7	5.13	1.94
W 10×45	13.3	4.32	2.01
W 12×50	14.6	5.18	1.96

(14)

- (b) What is residual stress? What are the sources of residual stress? Show the effect of residual stress on stress-strain relationship of a steel member. (06)
2. (a) Using AISC-ASD method, determine the capacity of column having cross section and support conditions shown in the **figure 2(a)**. Use A572 grade 50 steel. (12)
- (b) Calculate effective length factors ( $k$ ) for all columns shown in the **figure 2(b)**. Beams have moment of inertia value of 833 in<sup>4</sup> and columns have moment of inertia value of 716 in<sup>4</sup>. Alignment chart is provided in **table-1** (08)
3. (a) Determine the load capacity in tension for an L (6×4×1/2) section of A572 grade 50 steel connected with 3/8" diameter bolts in standard holes as shown in the **figure 3(a)**. Calculate reduction coefficient ( $U$ ) using equation method. Use AISC-ASD method. (10)
- (b) Explain shear lag. (03)
- (c) List advantages of steel structures as a building material. (04)
- (d) Write down the classification of column. (03)
4. (a) Determine the net area for the angle section L(8×6×1/4) shown in the **figure 4(a)** if 7/8" diameter bolts are used. (06)
- (b) Investigate the block shear failure mode on the angle L(4×4×1/4) attached with 3/8" diameter bolts to a 1/2" gusset plate as shown in the **figure 4(b)**. The material is A572 grade 50 steel. (12)
- (c) Define stiffened and unstiffened element. (02)

Table -01



Critical Buckling Stress:

$$F_{cr} = [0.658^{F_y/F_e}] F_y$$

$$F_{cr} = [0.877 F_e]$$

Block shear capacity: Nominal strength

$$R_n = 0.6 F_y A_{gv} + U_{bs} F_u A_{nt}$$

$$R_n = 0.6 F_u A_{nv} + U_{bs} F_u A_{nt}$$

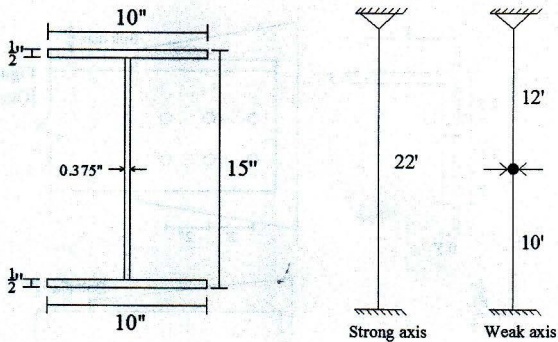


Figure: 2(a) [Question no. 2(a)]

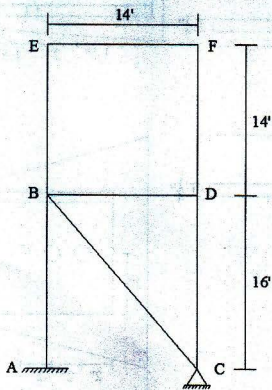
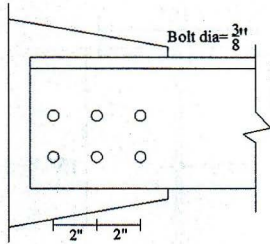
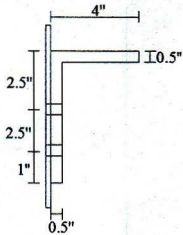
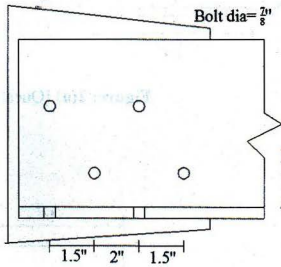
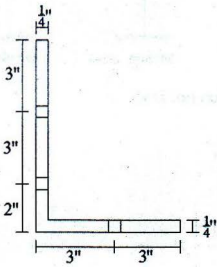


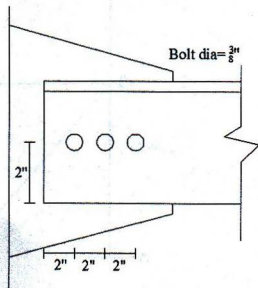
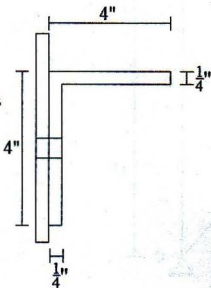
Figure: 2(b) [Question no. 2(b)]



**Figure: 3(a)**  
[Question no. 3(a)]



**Figure:4(a)**  
[Question no. 4(a)]



**Figure: 4(b)**  
[Question no. 4(b)]

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2015**  
**Program: B. Sc. Engineering (Civil)**

Course Title: Environmental Engineering III  
 Time- 1 hour

Course Code: CE 431  
 Full marks: 50

There are **THREE** questions. Question 1 is mandatory. In addition, answer any **ONE** between questions 2 and 3. ( $2.5 * 2 = 50$ )

1. (a) Explain putrescible and non-putrescible types of solid waste. What are the most important properties to be known if the solid wastes are to be used as fuel? (7)
- (b) What is source reduction/waste minimization? List the beneficial consequences of source reduction in relation to climate change issues. (2+4)
- (c) A summary table for the chemical components of a solid waste sample is given below. Determine approximate chemical formulas with and without sulfur. (12)

Component	Moisture	Carbon	Hydrogen	Oxygen	Nitrogen	Sulfur	Ash
Mass (kg)	25.60	50.20	5.56	35.00	0.45	0.26	7.14
Molar Mass (kg/mol)	-	12.00	1.00	16.00	14.00	32.00	-

2. (a) Provide examples on how on-site processing are achieved in developing countries? How can you achieve it in your daily life (provide at least 2 examples) (6)
- (b) Compare the solid waste collection system with and without transfer station on our country's context. (6)
- (c) What factors or items would you include in assessing the economic costs of solid waste collection? An individual tractor-trailer costs \$140000, which has to be amortized over a 10-year period using a 12% discount factor. Find the annual cost of the vehicle. (8)
- (d) For a stationary container system, 20 numbers of containers are emptied per trip, each having a volume of  $3.75 \text{ m}^3$ . The container utilization factor and collection vehicle compaction ratio are 0.8 and 2.75 respectively. Determine the approximate truck capacity. (5)



3. (a) How can you calculate source reduction? (5)
- (b) Mention the outcomes of proximate analysis and ultimate analysis? What are the considerations to forecast future waste quantities? (4+4)
- (c) Determine the break-even time for a stationary container system with a separate transfer and transport system for transporting wastes collected from a municipal area to a landfill site. Assume the following data while calculating (12)

Transportation cost:

Stationary container system using an 18 m<sup>3</sup> compactor: BDT 2000/ hr  
 Tractor-trailer transport unit with a capacity of 120 m<sup>3</sup>: BDT 2500/ hr

Other costs:

Transfer station operating cost: BDT 40/m<sup>3</sup>

Extra cost for unloading facilities: BDT 5/m<sup>3</sup>

Other data:

Density of wastes in compactor = 350 kg/ m<sup>3</sup>

Density of wastes in transport unit = 160 kg/ m<sup>3</sup>

**Given Formula:**

Haul Container System	Stationary Container System
$T_{hcs} = (PT_{hcs} + q + m + nx)$ $PT_{hcs} = pc + uc + dbc$ $Md = ((1-W)L(t_1 + t_2)) / T_{hcs}$	$T_{scs} = (PT_{scs} + q + m + nx)$ $PT_{scs} = C_{uc} + (S-1)(dbc)$ $C_r = \frac{V_z}{V_f}$ $M_{bc} = \frac{V_f}{V_z}$ $L = \frac{(t_1 + t_2) + M_{bc}(PT_{scs} + q + m + nx)}{1 - W}$

$$A = P \left[ \frac{i(1+i)^n}{(1+i)^n - 1} \right]$$

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination, Spring 2015**  
**Program: B.Sc. Engineering**

Course Title : Environmental Engineering IV  
Time: 1 Hour

Course Code : CE 433  
Full Marks: 40

**Answer all the following questions**

**Assume reasonable value for any missing data ( if applicable)**

1. (a) What is Persistent Organic Pollutants? Write down three effects of POPs on human health. (3)  
(b) On January, 15, 2015, the following air quality data was recorded at Shangshad Bhaban CAMS in Dhaka, (7)  
 $PM_{2.5} = 175 \mu\text{g}/\text{m}^3$  (24 hr)  
 $PM_{10} = 250 \mu\text{g}/\text{m}^3$  (24 hr)  
 $O_3 = 0.095 \text{ ppm}$  (8 hr)  
Calculate AQI for that day. Also, prepare the AQI report. (Given:  $T = 25^\circ\text{C}$ ,  $P = 1 \text{ atm}$ ; Table for calculating AQI provided)
  
2. (a) What is Carboxy hemoglobin? What are the problems associated with its formation. (3)  
(b) A 625 MW coal fired power plant has a 185 m stack with inside radius of 2.5 m. The exit velocity of the stack gases is estimated at 17 m/s, at a temperature of  $140^\circ\text{C}$  (413K). Ambient temperature is  $25^\circ\text{C}$  (298K) and wind at stack height is estimated to be 7 m/s. Estimate the effective height of the stack if the atmosphere is slightly unstable, class C. (7)
  
3. (a) Show the rate of change of air pollution with altitude in a diagram (4)  
(b) Calculate the fractional efficiency of  $20 \mu\text{m}$  particles in the settling tank of  $L = 2H$ . Given Horizontal velocity of the particle is 0.37 m/s. Temperature =  $85^\circ\text{C}$ . Particle specific gravity = 1.8. (6)
  
4. (a) Draw shapes of different types of plumes emitted from a stack. (5)  
(b) Draw the concept of 'Air pollution system and its control' (5)

Table 1: AQI for different pollutants

Breakpoints							AQI	Category
O <sub>3</sub> (ppm) 8-hr	O <sub>3</sub> (ppm) 1-hr (I)	PM <sub>2.5</sub> (µg/m <sup>3</sup> ) 24-hr	PM <sub>10</sub> (µg/m <sup>3</sup> ) 24-hr	CO (ppm) 8-hr	SO <sub>2</sub> (ppm) 24-hr	SO <sub>2</sub> (ppm) Annual		
0.000-0.064	—	0.0-15.4	0-54	0.0-4.4	0.000-0.034	(I)	0-50	Good
0.065-0.084	—	15.5-40.4	55-54	4.5-9.4	0.035-0.144	(II)	51-100	Moderate
0.085-0.104	0.125-0.164	40.5-65.4	155-254	9.5-12.4	0.145-0.224	(III)	101-150	Unhealthy for sensitive group
0.105-0.124	0.165-0.204	65.5-150.4	255-354	12.5-15.4	0.225-0.304	(IV)	151-200	Unhealthy
0.125-0.374	0.205-0.404	150.5-250.4	355-424	15.5-30.4	0.305-0.604	0.65-1.24	201-300	Very unhealthy
(III)	0.405-0.504	250.5-350.4	425-504	30.5-40.4	0.605-0.804	1.25-1.64	301-400	Hazardous
(III)	0.505-0.604	350.5-500.4	505-604	40.5-50.4	0.805-1.004	1.65-2.04	401-500	Hazardous

Necessary formula

$$S = (g/Ta) (dT_a/dz + \Gamma)$$

$$F = gr^2 v_s (1 - T_a/T_s)$$

$$\Delta h = \frac{1.6F^{1/3} x_f^{2/3}}{u}$$

$$\Delta h = 2.4 \times (F/uS)^{1/3} \quad \eta = \frac{L \cdot g \cdot d_p^2 \cdot \rho_p}{H \cdot v_h \cdot 18\mu}$$

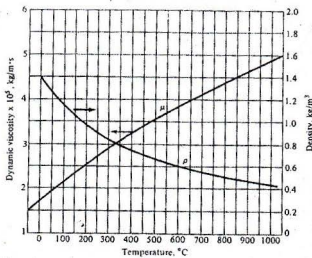


Figure : 1 : Density and dynamic viscosity of pure air at 1.0 atm pressure as a function of temperature

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Midterm Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course code: CE 439

Course title: Environmental Engineering VII (Environmental Impact Assessment)

Time: 60 Minutes

Full marks: 20

**Answer ALL questions**

1. Define the following: (6)
  - Environmental Impact Assessment (EIA)
  - Screening
  - Initial Environmental Examination
  - Scoping
  - Impact analysis
  - Baseline studies
  
2. Draw the flow diagram of EIA process and parallel studies (3)
  
3. According to Article 7 of the Bangladesh Environmental Conservation Rules (1997), write the procedures to obtain environmental clearance certificate for a red category factory? (3)
  
4. Explain five public involvement techniques along with description of their uses and their advantages and disadvantages. (5)
  
5. What are the common formal methods used for impact identification in an EIA process? (1.5)
  
6. Write four possible outcomes of screening process in EIA (1.5)

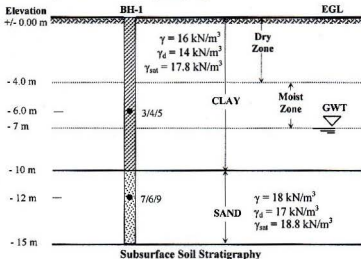
**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid-Term Examination, Spring 2015**

Course # CE 441  
 Full Marks: 40 (10 X 4 = 40)

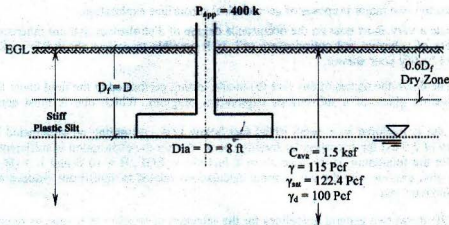
Course Title: Geotechnical Engineering II  
 Time: 1 hour

Answer any four (4) of the following five (5) questions

1. (a) Mention two major purposes of geotechnical subsurface exploration. 2  
 (b) Write a very short note on the occurrence degree of disturbances that are inherent during sampling of cohesive and cohesionless soil. Is it possible to collect absolutely undisturbed sample? Justify your answer. 8
  
2. (a) Write down the names of any five (5) in-situ testing performed in the field under the field investigation phase of a sub-surface exploration program. Which one is most commonly used? 2  
 (b) A site is explored to a depth of 20 feet below EGL. Assuming an anticipated bearing capacity of 2.0 ksf for a rectangular footing check whether the exploration is sufficient or not. Consider the foundation level to be about 8 feet below EGL,  $B = 10$  ft and  $L = (B + 2)$  ft. Justify your answer with the aid of some calculations related to significant induced stress at the foundation level. 8
  
3. (a) Write down two general guidelines for the selection of location of boreholes required for a sub-surface exploration project. 3  
 (b) Write down the names of any five (5) in-situ testing performed in the field under the field investigation phase of a sub-surface exploration program. Which one is most commonly used? 3  
 (c) Discuss, in brief, on any one (except standard penetration test) of the in-situ tests. 4
  
4. Borehole information obtained for a **preliminary** geotechnical sub-surface exploration at a site in Munshiganj, is shown in the figure below. Determine the Field SPT-N values at elevations -6 m and -12 m. Apply necessary corrections, as required, and determine the corrected SPT values (Use Appendix as necessary). 10  
**Notes:** - Wash Boring method was used.  
 - Hammer efficiency = 52%.  
 - Standard sampler was used during sampling.



5. (a) Draw a neat sketch showing local shear failure in medium stiff/dense soil. 2  
 (b) A column load is applied as shown below without calculating bearing capacity. Using Terzaghi's bearing capacity equation (TBCE), determine the ultimate bearing capacity for the following circular spread footing and from thereby estimate the actual factor of safety of the foundation system comment on it. 8



**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Transportation Engineering II  
Time: 1 Hour

Course Code: CE 451  
Full Marks: 30

There are Four questions. Answer any Three

1. (a) What is permanent way? (01)  
(b) What are the consequences that may arise due to non-uniformity of gauges? (03)  
(c) Explain the following terms: (04)
    - i. Coning of wheel
    - ii. Tilting of rails
  - (d) What are the methods adopted to reduce wearing of rails? (02)
  2. (a) Compare between wooden sleeper and concrete sleeper. (04)  
(b) What are the qualities that good ballast should have? (03)  
(c) Why is it necessary to provide elastic fastenings? Mention some of requirements for an elastic fastening. (03)
  3. (a) A transition curve is to be used to join the ends of a three degree circular curve with the straight. The length of the transition curve is 150 m. Work out the shift and offsets at every 30 m interval. Provided that  $S = L^2/24R$ . (03)  
(b) Define: (05)
    - i. Cant deficiency
    - ii. Cant excess
    - iii. Point
    - iv. Crossing
    - v. Check rail
  - (c) Write a short note on Marshal Yard. (02)
  4. (a) A B.G. steam locomotive with 2 pairs of driving wheels with axle load of 20 tons each runs on a straight level track at a speed of 80 kmph. Assume coefficient of friction as 0.2. (06)
    - i. Calculate the maximum permissible load that the train can carry.
    - ii. Calculate the reduction in speed if the train has to run on a rising gradient of 1 in 200.
    - iii. Calculate further reduction in speed if the train has to negotiate a 40 curve on the rising gradient.
- Formulae:
- $$\begin{aligned} R_1 &= 0.0016W \\ R_2 &= 0.00008WV \\ R_3 &= 0.0000006WV^2 \\ R_5 &= \left. \begin{array}{l} 0.0002WD \\ 0.0003WD \\ 0.0004WD \end{array} \right\} \text{depending upon gauge} \end{aligned}$$
- (b) Show in sketch with necessary essential parts. (04)
    - i. Compressed air brake
    - ii. Vacuum brake

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Midterm Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course code: CE 461  
Course title: Irrigation and Flood Control  
Time: 60 Minutes

Total marks: 60

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

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**SECTION A**  
**MARKS: 45**

**Answer all questions**

1. Write the benefits of irrigation and the harmful effects of excess irrigation. (4.5)
  
2. A sample of water from a well showed that it has an electrical conductivity of 1 mmhos/cm and a density of 1 gm/cm<sup>3</sup>. A field with a bulk density of soil of 1.48 gm/cm<sup>3</sup> and saturation point of 36 percent will be irrigated. Find out the depth of irrigation that may turn the 30 cm depth of soil saline ignoring the precipitation and leaching of salts that may occur. (9)
  
3. Derive the relationship between depth of irrigation water, consumptive use of water and leaching requirement. (6)
  
4. a) Explain sub-surface irrigation system along with sketch? (4.5)  
b) Describe basin flooding method along with its advantages and disadvantages (6)
  
5. Determine the time required to irrigate a strip of land of 450 m<sup>2</sup> in area from a tube-well with a discharge of 1.8 m<sup>3</sup>/minute. The infiltration capacity of the soil may be taken as 1 millimeter/minute and the average depth of flow on the field as 199 millimeter. (9)
  
6. Explain soil moisture tension and soil moisture stress. (6)



**SECTION B**  
**MARKS: 15**

**Answer question number 7 and any one from the rest**

7. i. Define flood. What are the causes of flood? (1.5+3)  
ii. Define river. What are the functions of a river? (1.5+3)
8. Explain the following (any two) (2x3)  
i. Hydrological classification of flood  
ii. Flood plain  
iii. Return period
9. i. Name the hydrological regions of Bangladesh (2)  
ii. Explain impacts of flood (4)

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid term Examination Spring 2015**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Chemistry  
Time: 1 hour

Course Code: CHEM 111  
Full Marks: 60

There are *four* questions. Answer *any three* questions.

1. (a) State and explain Pauli Exclusion Principle. [4]
- (b) What is meant by ionic radius? Which one of the following pairs has larger radius? Explain. [8]  

$\text{Mg}$  and  $\text{Mg}^{2+}$ ,  $\text{S}$  and  $\text{S}^{2-}$
- (c) Predict the geometry of the  $\text{BF}_3$ ,  $\text{NF}_3$ ,  $\text{IF}_5$ ,  $\text{XeF}_4$  molecules by VSEPR model. You must show your work to get full credit on this question. [8]
2. (a) Which one of  $\text{H}_2\text{O}$  and  $\text{CO}_2$  molecules has larger dipole moment? Explain your answer. [5]
- (b) What are the bonding and anti-bonding molecular orbitals? [5]
- (c) Draw the molecular orbital diagram of  $\text{N}_2$  molecule. Is this molecule diamagnetic or paramagnetic? What is the bond order of  $\text{N}_2$ ? [6+2+2]
3. (a) Define orbital? What are the physical significances of  $\Psi^2$ ? [5]
- (b) Which of the following orbitals are NOT permissible? Explain.  
 $3p$ ,  $2d$ ,  $1p$ ,  $3f$ ,  $2s$  [8]
- (c) What is the wavelength of light emitted when the electron in a hydrogen atom undergoes a transition from energy level  $n = 3$  to level  $n = 2$ ? [7]
4. (a) Define ionization potential and electron affinity. How do they change in the periodic table? [4+4]
- (b) Applying VBT explain the bonding of water molecule. [6]
- (c) What are  $\sigma$  bond and  $\pi$  bond? Draw the orbital picture to show the formation of these bonds. [6]

University of Asia Pacific

Department of Civil Engineering

Mid-Semester Examination Spring-2015

Program: B. Sc Engineering (2<sup>nd</sup> Year / 1<sup>st</sup> Semester)

Course Title: Basic Electrical Engineering Course No. ECE (CE) 201

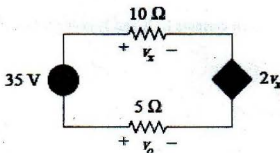
Credits: 3.00

Time: 1.00 Hour.

Full Marks: 60

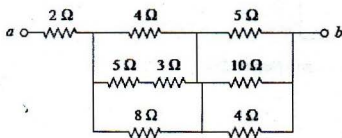
There are **Four** Questions. Answer any **Three**. Figures in the right margin indicate marks.

1. (a) Find  $V_x$  and  $V_o$  in the following circuit. (10)



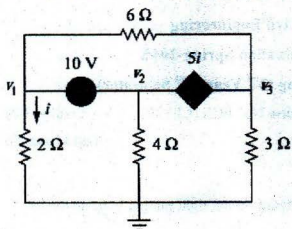
Circuit diagram for question 1(a)

- (b) Reduce the following circuit to a single resistor at terminal a-b. (10)



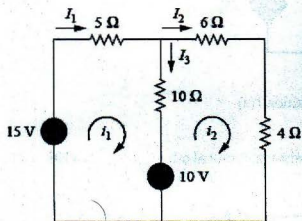
Circuit diagram for question 1(b)

2. (a) Find  $v_1$ ,  $v_2$  and  $v_3$  in the following circuit using nodal analysis. (10)



Circuit diagram for question 2(a)

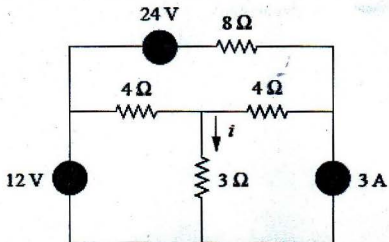
- (b) Use mesh analysis to find the branch currents  $I_1$ ,  $I_2$  and  $I_3$  in the following circuit. (10)



Circuit diagram for question 2(b)

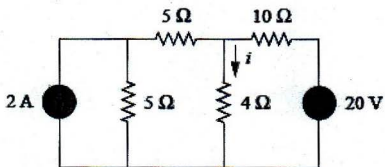
3. (a) Write Short notes on the following terms : (8)
- Ohm's Law
  - KCL
  - Superposition theorem
  - Thevenin's theorem

- (b) For the following circuit, use the superposition theorem to find  $i$ . (12)



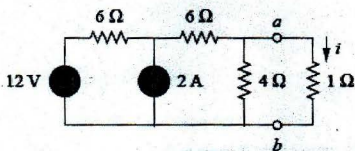
Circuit diagram for question 3(b)

4. (a) Find  $i$  in the following circuit using source transformation. (10)



Circuit diagram for question 4(a)

(b) Find the Thevenin equivalent circuit of the following circuit to the left of the terminal a-b. Also find the current  $i$ .



Circuit diagram for question 4(b)

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid-Term Examination, Spring-2015**  
**Program: B.SC Engineering (2<sup>nd</sup> Year/2<sup>nd</sup> Semester)**

Course Title: Principle of Economics      Course Code: ECN 201      Credit: 2.00  
Time: 1 Hour      Full Marks: 20

Answer any **four** from the following questions:

1. (a) Explain the law of supply graphically. (3)  
(b) Find the equilibrium price and quantity from the following markets: (2)  
 $Q_d = 100 - 2P$ ,  $Q_s = -50 + 2P$
2. Explain the Diminishing Law of Marginal Rate of Substitution. (5)
3. (a) Explain the diminishing law of marginal product. (3)  
(b) Define: Perfectly elastic and inelastic demand (2)
4. Calculate the cross price elasticity of demand between Tea and Coffee (5)

Here Tea is good 1 and Coffee is good 2

	Before		After	
	Price [Tk]	Quantity [Units/month]	Price [Tk]	Quantity [Units/month]
Tea	30	40	50	10
Coffee	45	15	40	45

5. Given the demand function,  $P_d = 145 - Q^2$  and supply function,  $P_s = (Q+1)^2$  (5)

Find the Consumers' Surplus and Producers' Surplus.

University of Asia Pacific  
Mid Semester Examination (Spring 2015)  
Program: B.Sc. Engineering  
Department of Civil Engineering  
Year: 1<sup>st</sup>, Semester: 1<sup>st</sup>

Course Code: HSS101

Course Title: English Language I

Time: 1Hour

Full Marks: 20

\*Marks are indicated in the right margin

Answer all of the following questions. Copy the complete sentences to answer them.

1. Fill in the blanks with appropriate prepositions: 4
- a. The two companies are completely independent. There's no connection \_\_\_\_\_ them.
  - b. The advantage \_\_\_\_\_ having a car is that you don't have to rely on public transport.
  - c. The week begins \_\_\_\_\_ Sunday.
  - d. It was only \_\_\_\_\_ accident that I found out who the man really was.
  - e. "Hamlet" and "Macbeth" are plays \_\_\_\_\_ Shakespeare.
  - f. He likes to read \_\_\_\_\_ the afternoon.
  - g. Stop staring \_\_\_\_\_ me.
  - h. I'm looking \_\_\_\_\_ my keys.
2. Fill in the blanks with appropriate pronouns or possessives: 4
- a. Alice and Doris collected the stickers \_\_\_\_\_.
  - b. He knows the girl \_\_\_\_\_ has three dogs.
  - c. They think everything is \_\_\_\_\_.
  - d. My mother often talks to \_\_\_\_\_.
  - e. Mrs. Miller, \_\_\_\_\_ father is a painter, came to New York in 1950.
  - f. Emma, did you take the photo by \_\_\_\_\_?
  - g. This present is for \_\_\_\_\_.
  - h. This sandwich is better than \_\_\_\_\_.



3. Use appropriate articles in the following passage (where necessary): 4

Jim, \_\_\_\_\_ old friend of mine, used to work in downtown Los Angeles. He had \_\_\_\_\_ good job in one of \_\_\_\_\_ biggest law firms in \_\_\_\_\_ city. He was \_\_\_\_\_ honest, hard-working lawyer, but he hated his job, so he decided to quit and become \_\_\_\_\_ surfer instead. Now Jim spends his days surfing \_\_\_\_\_ waves of Malibu. It isn't \_\_\_\_\_ easy life, but it makes him happy.

4. Use the correct form of the verb: 4

- a. You look really great! (you, work) \_\_\_\_\_ out at the fitness center recently?
- b. Sami (arrive) \_\_\_\_\_ in Dhaka a week ago.
- c. Shhh! Be quiet John (sleep) \_\_\_\_\_.
- d. I \_\_\_\_\_ (+/already/take some photos)
- e. I \_\_\_\_\_ (not+make) my bed yet.
- f. \_\_\_\_\_ you \_\_\_\_\_ the door? (to close)
- g. \_\_\_\_\_ here \_\_\_\_\_ five years? (John/to live/for)
- h. Why \_\_\_\_\_ the tyres? (not/check/yet)

5. Complete the following sentences according to the directions: 4

- a. A lily was not so ~~of~~ white as her hand. (Make it comparative)
- b. He is a great fool. (Make it interrogative)
- c. She did not recognize him at once. (Make it affirmative)
- d. Walking is the best exercise. (Make it comparative)
- e. John broke another glass today. (Make it negative)
- f. He is less lazy than you said. (Make it positive)
- g. He is worse than any other student. (Make it superlative)
- h. A jet flies faster than an aeroplane. (Make it positive)

**University of Asia Pacific**  
**Department of Civil Engineering**  
Mid-term Examination: Spring 2015  
Program: B. Sc Engineering

Course Title: English Language II

Course Code: HSS 103

Time: 01:00 hour

Full Mark: 30

\*Marks are indicated in the right margin.

Answer all the questions in a separate answer scripts.

1. Rewrite **any eight (08)** of the following sentences correctly: 04
- a) *The Avengers* were a successful film.
  - b) Ten miles are too far to walk.
  - c) Some of the questions seems too hard.
  - d) Most of the seats was taken.
  - e) A pound of biscuits cost about 100 taka.
  - f) Mamun used to playing football.
  - g) The project already rose a heavy fund for the victims.
  - h) Nobody know where he lives.
  - i) Measles are an airborn disease which spread easily through coughing.
2. Complete any **four (04)** of the following sentences using correct conditional structures: 04
- a) ..... if the teacher explained the grammar once more.
  - b) If he has time, .....
  - c) .....I would invite him to my birthday party.
  - d) If we'd known about his problems.....
  - e) ..... you'll shiver from cold.
3. Make sentences with **any three (03)** of the following pairs of words: 03
- |            |          |         |            |
|------------|----------|---------|------------|
| a) Bookish | b) Drown | c) Hire | d) Climate |
| Learned    | Sink     | Rent    | Weather    |

4. Write one synonym and one antonym of any three (03) of the following words and make sentences with those synonyms and antonyms: 03

a) Reveal:

Synonym:..... Sentence:

Antonym:..... Sentence:

b) Chaos:

Synonym:..... Sentence:

Antonym:..... Sentence

c) Admire:

Synonym:..... Sentence:

Antonym:..... Sentence

d) Enormous:

Synonym:..... Sentence:

Antonym:..... Sentence:

5. Join any three (3) of the following pairs of sentences with appropriate conjunctions or relative pronouns: 03

a) The students were tearful at the ceremony. Their teacher was leaving. (and, while, because)

b) The athlete is young. He is energetic. (but, and, yet)

c) It has threatened to rain all afternoon till now. There has not been a single drop! (for, but, lest)

d) Mr. Kamal could not remember the place. He had parked his car. (wherever, where, that)

6. Read the passage carefully. Take notes by using any one of the five methods appropriate for the passage. 04

**A**nimals living in modern zoos enjoy several advantages over animals in the wild; however, they must so suffer some disadvantages. One advantage of living in the zoo is that the animals are separated from their natural predators; they are protected and can, therefore, live without risk of being attacked. Another advantage is that they are regularly fed a special, well-balanced diet; thus, they do not have to hunt for food or suffer times when food is hard to find. On the other hand, zoo animals face several disadvantages. The most important disadvantage is that since they do not have to hunt for food or face their enemies, some animals became bored, discontented or even nervous. Another disadvantage is that zoo visitors can endanger their lives. Some animals can pick up airborne diseases from humans.

**University of Asia Pacific**  
**Department of Basic Sciences and Humanities**  
**Mid-Semester Examination Spring-2015**  
**Program: B.Sc. Engineering (Civil)**  
**2<sup>nd</sup> year 1<sup>st</sup> semester**

Course Title: Bangladesh Studies: History    Course No: HSS211(b)  
Time: 1 Hour

Credit: 2.00  
Full Marks: 40

There are FIVE questions below. Answer ANY FOUR (4 x 10)

1. What were the *Janapadas*? What are the present locations of different *Janapads* of ancient Bengal?
2. Which dynasty ruled Bengal for 400 years? Who was the founder of this dynasty? How did he come to power?
3. Who offered all facilities to Sri Chaitannya in his religious propagation? What do you know about his literary appreciation and role in spreading Islam?
4. Who were the *Bara Bhuiyans*? How did the Mughals at last suppress them?
5. Write down a short note on '*Shaista Khan's conquest of Chittagong*'.

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**Mid Semester Examination, Spring 2015**  
**Programme: B. Sc. Engineering (Civil)**  
**(2<sup>nd</sup> Year 1<sup>st</sup> Semester)**

**Course Title: Bangladesh Studies: Society and Culture      Course Code: HSS 211(a)**

**Credit: 2.00**

**Time: 1 Hour**

**Full Marks: 40**

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There are FIVE questions. Answer ANY FOUR (4x10)

1. Define Sociology. How can Sociology help us in our lives? Name different branches of Sociology. 2+6+2
2. Define institution and association. Show the differences between institution and association. 2+8
3. What is a social group? Discuss the different types of social groups. 3+7
4. Can we categorize families according to their structures and relationships among the people in them? Explain with examples. 8+2
5. Define social mobility. What are the different types of social mobility? Briefly discuss the factors of social mobility in Bangladesh. 1+4+5

# University of Asia Pacific

## Department of Civil Engineering

### Mid-Semester Examination Spring-2015

#### Program: B. Sc in Civil Engineering 3<sup>rd</sup> Year 2<sup>nd</sup> Semester

Course Title: Principles of Management.

Course No. IMG 301

Credit: 2.00

Time: 1.00 Hour.

Full Marks:20

#### Part A:

Time: <10 min

Marks:10@0.5 = 10

Q#1: Best Matching:

5@0.5

1 = Creativity;

2 = Efficiency;

3=Liaison;

4 = Controlling Function;

5 = None

-----: "Encircle Bata" campaign by Apex.

-----: The ability and power to develop new ideas.

-----: The achievement of the ends with the least amount of resources.

-----: Filling and keeping filled the positions of the organization.

-----: Compromise between conflicting interest groups.

Q#2: Pick the right one:

5@0.5

"No competition" at all.

: blue ocean/ red ocean/ none.

Motivating and influencing the employees.

: planning/ leading/ none.

You are solving a problem before complain.

: reaction/ proaction/ none.

You are receiving an email from a friend.

: liaison/ disseminator/ none.

Top level managers need mostly

: human skill/ technical skill/ none.

-----  
tear here

#### Part B: (Skip One)

Time:{1 hr - Part A}

Marks: 3@ 5 = 15

Q#3: Describe the Planning and Staffing Functions of Managers.

Q#4: Explain the Japanese Management System.

Q#5: What is MNC? Discuss the various types of MNCs?

Q#6: Describe the Delphi technique process. How it differs from Brainstorming?

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**Department of Basic Sciences & Humanities**  
**Mid Semester Examination, Spring-2015**  
**Program: B.Sc. Engineering (Civil Engineering)**  
**1<sup>st</sup>Year / 1<sup>st</sup>Semester**

Course Title: Mathematics I

Course Code: MTH 101

Time: 1 hr

Full Marks: 60

Answer any **three** of the followings:

3×20 = 60

1. (a) Define into function and onto function with examples. 8
- (b) Define domain, co-domain and range of a function  $f(x)$ . Sketch and determine the domain and range of the following functions (any two): 12
  - (i)  $f(x) = |\sin x| + 1$
  - (ii)  $f(x) = 2x + |2 - x|$
  - (iii)  $f(x) = \frac{x^2 - 2}{x - \sqrt{2}}$ .
2. (a) Define continuity of a function  $f(x)$  at a point  $x = a$ . Find the value of  $k$  for which the function 10

$$f(x) = \begin{cases} \frac{x^2 - 9}{x - 3}, & x \neq 3 \\ k, & x = 3 \end{cases}$$

will be continuous at  $x = 3$ .
- (b) Define  $\delta - \epsilon$  definition of limit of  $f(x)$  at  $x = a$ . Prove that  $\lim_{x \rightarrow 3} 3x - 5 = 4$  10
3. (a) Define instantaneous rate of change and average rate of change. Find the instantaneous rate of change and average rate of change  $f(x) = \frac{x^2}{2}$  over  $[0, 4]$ . 12
- (b) A 17 ft. ladder is leaning against a wall. If the bottom of the ladder is pulled along the ground away from the wall at a constant rate of 5 ft/sec, how fast will the top of the ladder be moving down the wall when it is 8 ft. above the ground? 8
4. (a) Define successive differentiation. Find the  $n$ th derivative of  $f(x) = \cos(ax + b)$  10
- (b) State Leibnitz's theorem. If  $y = (\sin^{-1} x)^2$  then show that 10

$$(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - n^2y_n = 0.$$

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**Mid Semester Examination, Spring-2015**  
**Program: B.Sc. Engineering (Civil Engineering)**  
**1<sup>st</sup> Year / 2<sup>nd</sup> Semester**

Course Title: Mathematics II

Time: 1 hr

Answer any **three** of the followings:

Course Code: MTH 103

Full Marks: 60

3×20 = 60

1. (a) Define direction cosines of a line. If  $l, m, n$  be the direction cosines of any line then prove that  $l^2 + m^2 + n^2 = 1$ . 12  
(b) Find the direction cosines of the line which is equally inclined to the axes. 8
2. (a) Show that the four points  $(0, -1, -1)$ ,  $(4, 5, 1)$ ,  $(3, 9, 4)$  and  $(-4, 4, 4)$  are coplanar. 10  
(b) Find the equation of the plane through  $(-1, 3, 2)$  and perpendicular to the two planes  $x + 2y + 2z = 5$  and  $3x + 3y + 2z = 8$ . 10
3. (a) Find the coordinates of the point where the joining of two points  $(2, -3, 1)$  and  $(3, -4, -5)$  cuts the plane  $3x + 4y + 5z = 5$ . 10  
(b) Find the angle between the lines  $3x + 2y + z - 5 = 0 = x + y - 2z - 3$  and  $8x - 4y - 4z = 0 = 7x + 10y - 8z$ . 10
4. (a) Show that the equation  $3x^2 + 4y^2 + z^2 - 12x - 16y + 4z - 4 = 0$  represents an ellipsoid. Find also the centre and length of the semi axes. 10  
(b) Find the equation of the sphere through the points  $(0, 0, 0)$ ,  $(0, 1, -1)$ ,  $(-1, 2, 0)$  and  $(1, 2, 3)$ . 10



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**Program: B.Sc. Engineering (Civil Engineering)**  
**2<sup>nd</sup> Year / 1<sup>st</sup> Semester**

Course Title: Mathematics III

Course Code: MTH 201

Time: 1 hr

Full Marks: 60

Answer any **three** of the followings:

3×20 = 60

1. (a) Define inverse of a matrix. Does the inverse of a square matrix always exist? **10**

Make your comments. Find  $A^{-1}$  and show that  $A^{-1}A = I$  for the matrix

$$A = \begin{pmatrix} 1 & -5 \\ 0 & -1 \end{pmatrix}.$$

- (b) Solve for the following system of linear equations by using matrix method. **10**

$$2x_1 - 2x_2 + x_3 = 3$$

$$3x_1 + x_2 - x_3 = 7$$

$$x_1 - 3x_2 + 2x_3 = 0$$

2. (a) Solve the following system by using Gauss- Jordan Elimination. **10**

$$5x - 3y + 2z = 13$$

$$2x - y - 3z = 1$$

$$4x - 2y + 4z = 12$$

- (b) Find the rank of the matrix  $A$  where **10**

$$A = \begin{pmatrix} 1 & 3 & 1 & -2 & -3 \\ 1 & 4 & 3 & -1 & -4 \\ 2 & 3 & -4 & -7 & -3 \\ 3 & 8 & 1 & -7 & -8 \end{pmatrix}.$$

3. (a) Define linear combination. Determine whether or not the vector  $(1, 2, 6)$  is a linear combination of the vectors  $(2, 1, 0)$ ,  $(1, -1, 2)$  and  $(0, 3, -4)$ . **10**

- (b) Define linear dependence and independence of vectors. Determine whether the vectors  $(1, -2, 1)$ ,  $(0, -1, 0)$  and  $(2, 0, 2)$  in  $R^3$  are linearly dependent or independent. **10**

4. (a) Determine the value of  $a$  such that the following system of equations  $x$ ,  $y$  and  $z$  **15**

has: (i) a unique solution, (ii) no solution (iii) more than one solution

$$ax + y + z = 1$$

$$x + ay + z = 1$$

$$x + y + az = 1$$

(b) Given that  $A = \begin{pmatrix} 1 & 2 & -3 \\ 5 & 0 & 2 \\ 1 & -1 & 1 \end{pmatrix}$  and  $B = \begin{pmatrix} 1 & 3 \\ 2 & -1 \\ 0 & 4 \end{pmatrix}$ , find  $AB'$  and  $BA'$  if

5

possible.

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**2<sup>nd</sup> Year / 2<sup>nd</sup> Semester**

Course Title: Mathematics IV

Time: 1 hr

Answer any **three** of the followings:

Course Code: MTH 203

Full Marks: 60

3×20 = 60

1. (a) Define a Differential equation. Find the differential equation of 10

$$y = Ae^{2x} + Be^{-2x}.$$

- (b) Solve the differential equation: 10

$$\frac{dy}{dx} + 1 = e^{x-y}.$$

2. (a) Define Bernoulli's equation. Then solve the differential equation 12

$$\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y.$$

- (b) Solve the differential equation 8

$$p^2 - px - 2py + 2xy = 0, \text{ where } p = \frac{dy}{dx}.$$

3. (a) Define a linear differential equation with variable co-efficient of n-th order. 5

- (b) Find the solution of Euler's homogeneous linear differential equation 15

$$x^2 \frac{d^2 y}{dx^2} - 6x \frac{dy}{dx} + 6y = 0.$$

4. Solve the following differential equations: 20

(i)  $\frac{d^2 y}{dx^2} - 4y = x^2$

(ii)  $\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + 2y = e^x.$

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**Mid-Semester Examination Spring – 2015**  
**Program: B. Sc Engineering (Civil)**

Course Title: Physics I  
Time: 1.00 Hour

Course Code: PHY-101

Credit: 3.00  
Full Mark: 60

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**N.B-** There are **Four** Questions. Answer any **Three**. All questions are of equal value. Figures in the right margin indicate marks.

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1. (a) Prove that in case of volume strain, the work done per unit volume is equal to  $\frac{1}{2} \times \text{Stress} \times \text{Strain}$ . [10]
- (b) A wire of length  $1\text{ m}$  and diameter  $10^{-3}\text{ m}$  is stretched by  $6 \times 10^{-4}\text{ m}$  by a load  $10\text{ kg}$ . Calculate the Young's modulus of the wire. [10]
2. (a) State the perpendicular axis theorem and if Z axis is perpendicular to a plane lamina then derive that  $I_z = I_y + I_x$ , where X and Y are two mutually perpendicular axes. [10]
- (b) A circular disc of mass  $100\text{ gram}$  and radius  $10\text{ cm}$  is making  $120\text{ rpm}$  about an axis passing through its centre and perpendicular to its plane. Calculate its kinetic energy. [10]
3. (a) Show that the moment of inertia of a ring is  $MR^2$ , where the symbols have their usual meanings. Consider that the ring rotates about an axis passing through its centre and perpendicular to its plane. [10]
- (b) A flat circular disc of mass  $5\text{ kg}$  and diameter  $0.1\text{ m}$  is set rolling on a table with a velocity of  $0.2\text{ m/s}$  along a straight line on a horizontal surface. Calculate its kinetic energy. [10]
4. Establish that the equation for the intensity at a point on the screen in Young's experiment can be written as [20]

$$I = 4a^2 \cos^2 \frac{\delta}{2}$$

Where  $a$  and  $\delta$  are the wave amplitude and the phase difference between the two waves reaching the point considered. Using this equation find out the conditions under which bright and dark fringes are observed.