

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2018**  
**Program: B. Sc. in Civil Engineering**

Course Title: Professional Practices & Communication  
Time: 1 hour

Course Code: CE 403  
Full Marks: 40

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**Answer all of the following questions.**

**PART - A**

1. (a) In different contract documents different dates of completion of a project has been stated. (5)  
If a dispute arises as to when the project has to be completed, mention in order of priority the documents you will consider to establish the actual date.
- (b) Identify the qualities that a good technical specification should have. (5)
- (c) Using a flow chart depict the tendering process. (5)
- (d) List the essential elements of a tender document. (5)

**PART - B**

2. Read the following case carefully and answer the questions:  
Mr. Karim is a devout follower of Real Madrid Football Club. He tends to overlook the fouls his favorite team makes in a game; and still holds the opponent team responsible for their own loss, or the loss of his favorite team.
    - (a) Explain how Mr. Karim's attitude can cause a barrier in effective communication. (5)
    - (b) With necessary examples, explain the other barriers of communication that are related to the 'Receiver'. (5)
  3. (a) What are the seven Cs of effective communication? Briefly explain the issues the message sender should consider for the message to be 'complete'. Give examples where necessary. (6)
  - (b) Assess the **PART - B** of this question paper and comment on whether it has achieved 'Conciseness'. (4)
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**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2018**

Course Title: Structural Engineering V  
 Time: 1 hour

Course Code: CE 415  
 Full Marks: 60

(Answer all the following questions)

Assume any reasonable value for any missing data.

1. a) A simply supported prestressed-concrete rectangular beam 350 mm by 500 mm has a span of 10 m and is loaded by a uniform load of 35 kN/m including its self weight. The prestressing tendon is located as shown in Figure 1(a) and it produces an effective prestress of 1050 kN. Analyze the beam using load balancing method to get extreme fiber stresses at the midspan section. (15)

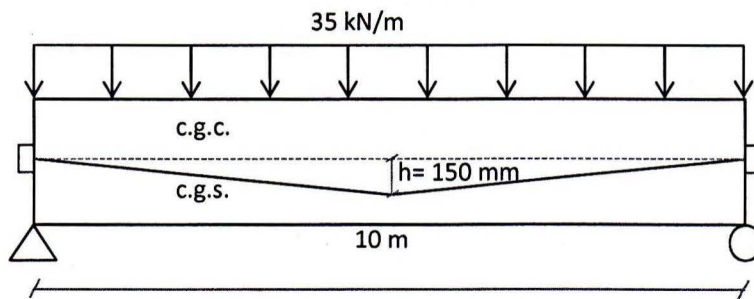


Figure 1(a)

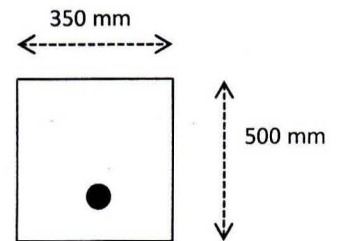


Figure 1(b) : Mid Section

- b) State the basic principles of prestressed concrete. (5)

2. a) A 20m long straight pretensioned concrete member with a cross section of 400 mm by 400 mm, is eccentrically prestressed using 750 mm<sup>2</sup> of steel wires which are anchored with an initial stress of 1035 MPa as shown in Figure 2. Calculate the loss of prestress due to elastic shortening of concrete at the transfer of prestress considering self weight of girder as  $W_G$ . Assume,  $K_{es} = 1$ ,  $E_c = 33000$  MPa &  $E_s = 200,000$  MPa. (15)

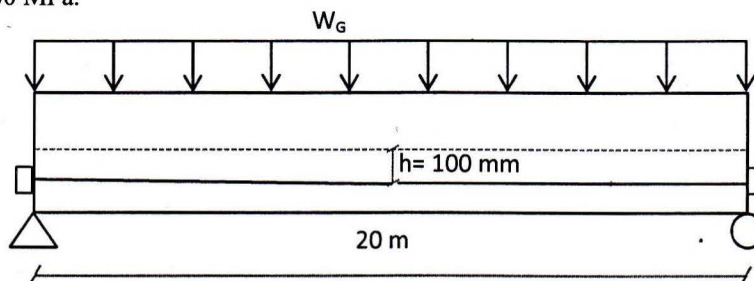
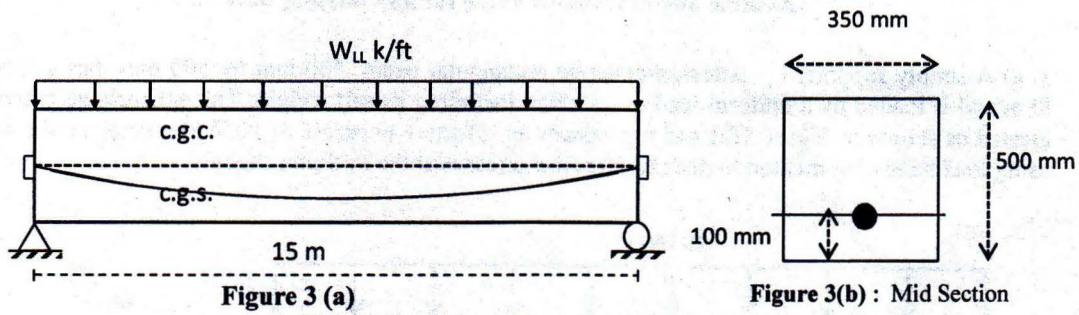


Figure 2

- b) Describe briefly the different sources which cause loss of prestress in a prestressed concrete member. (5)



3.a) A posttensioned bonded concrete beam has a cross section of 350 mm by 500 mm. The prestressing tendon is located as shown in the Figure 3(a) and it produces an effective prestress of 1050 kN. Analyze the beam to get maximum uniformly distributed live load that can be allowed for (i) zero tensile stress in the bottom fibers of midspan. (ii) cracking in the bottom fibers of midspan at a modulus of rupture 4.2 Mpa. Ignore self weight of the beam. (15)



b) What is the difference between partial and full prestressing? (5)

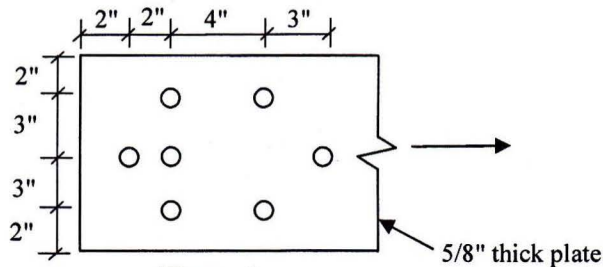
**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination Spring 2018**  
**Program: B. Sc. Engineering (Civil)**

Course Title: Structural Engineering VI (Design of Steel Structures)  
 Time: 1 hour

Course Code: CE 417  
 Full Marks: 3×10=30

**Answer all 03 (Three) questions**  
[Assume reasonable values for any missing data]

1. (a) State the differences between design of steel and concrete structure. (3)
- (b) Draw four shapes used as 'steel compression members'. (2)
- (c) Determine the minimum net area of the plate shown in **Figure 1**. The plate is under tension from one side only and the diameter of each bolt is 7/8 inch. (5)

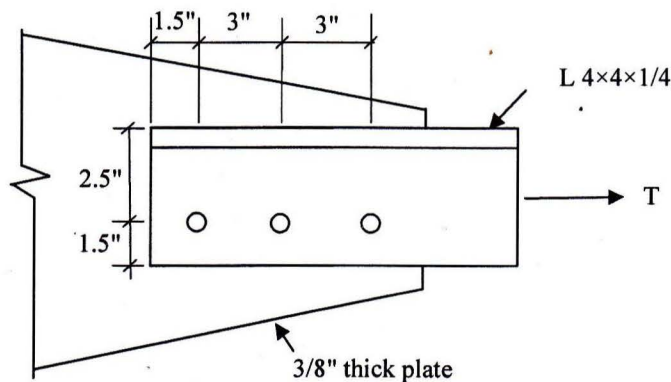


**Figure 1**

2. (a) What are the sources of residual stress? (1)  
 Show residual stresses in a hot rolled W shaped section with neat sketches. (2)
- (b) Investigate the tension capacity of the angle L 4×4×1/4 attached to a 3/8 inch thick gusset plate with three bolts as shown in **Figure 2**. Consider **all limit states** and assume uniform tension stress. The material is A36 ( $F_u = 58$  ksi) steel and bolts are 7/8- inch dia. with standard holes. Use **ASD** approach. (7)  
 Block shear capacity:

Given, Nominal strength:  $R_n = 0.6F_yA_{gv} + U_{bs}F_uA_{nt}$

$$R_n = 0.6F_uA_{nv} + U_{bs}F_uA_{nt}$$

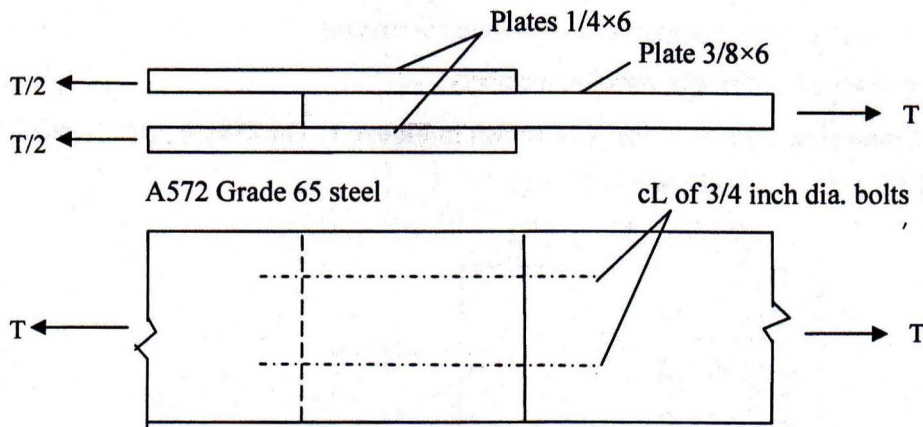


**Figure 2**

3. (a) Show the possible limit states that control the strength of a bolted connection with neat sketches. (3)
- (b) Determine the number of 3/4-in dia. A325 bolts ( $F_y=90$  ksi,  $F_u=120$  ksi) in standard holes required to develop the full strength of A572 Grade 65 ( $F_u=80$  ksi) steel plates shown in **Figure 3**. Assume the portion of double lap splice is a bearing type connection with **threads excluded from the shear planes** and a **double row of bolts** is used. Show neat sketch of the designed bolted connection. Use **AISC-LRFD** method and **ignore block shear mode**. (7)

Nominal strength,  $R_n = F_{nv} m A_b$  (shear)

$$R_n = 1.2 L_c t F_u \leq 2.4 F_u d t \text{ (bearing)}$$



**Figure 3**



**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2018 (Set 1)**

Course #: CE 423  
 Full Marks: 40 (= 4 × 10)

Course Title: Structural Engineering IX  
 Time: 1 hour

(Points on the right within parentheses indicate full marks)

[Given:  $f'_c = 3.0$  ksi,  $E_c = 3000$  ksi,  $f_y = 55$  ksi,  $E_s = 29000$  ksi, for all questions].

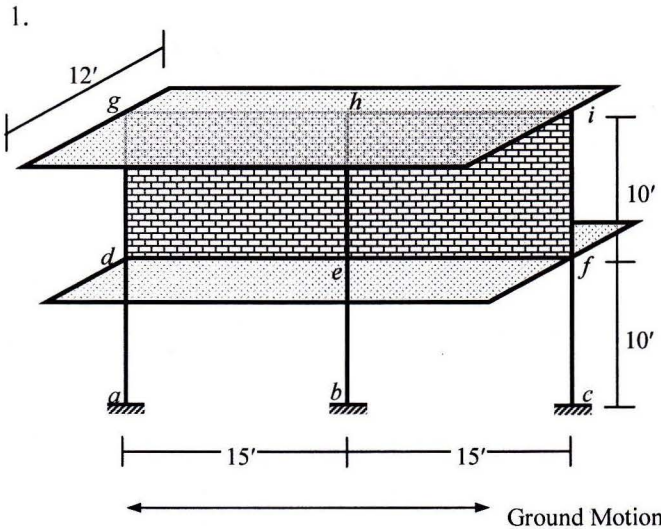


Fig. 1

The 2-storied frame shown in Fig. 1 weighs 300 psf and is supported by three (14"×14") RC columns at each floor.

Assume the 2<sup>nd</sup> floor is ten times stiffer than 1<sup>st</sup> floor columns combined ( $ad$ ,  $be$ ,  $cf$ ) due to the infill walls.

- (i) Determine the natural frequencies and first modal shape of the 2-DOF frame (7)
- (ii) Formulate the Rayleigh Damping Matrix of the frame assuming damping ratio 0.05 for both modes of vibration. (3)

2. Fig. 2 shows a 1-storied frame weighing 300 psf and supported by three (14"×14") RC columns ( $ad$ ,  $be$ ,  $cf$ ).

Use the BNBC 93 earthquake response spectrum for Sylhet ( $Z = 0.25$ , soil group  $S_1$ ) to calculate the

- (i) Elastic base shear, peak deformation and shear force for each column
- (ii) Inelastic base shear and peak deformation using Kent & Park (1971) equations, with special confining reinforcement ( $S_i$ ) as 'Major' seismic detailing.

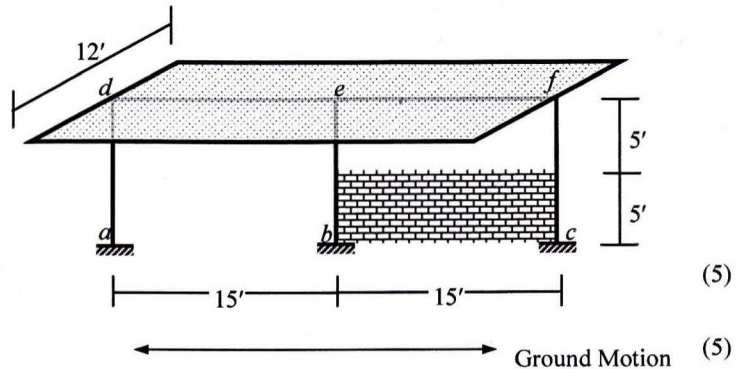


Fig. 2

3. For the 1-storied frame shown in Fig. 2

- (i) Calculate the required stirrup spacing of the beam  $def$  (cross-section in Fig. 3) to ensure it fails in flexure before shear failure
- (ii) Determine the required steel ratio of the (14"×14") column  $be$  to satisfy the 'Weak-Beam-Strong-Column' condition at joint  $e$ .

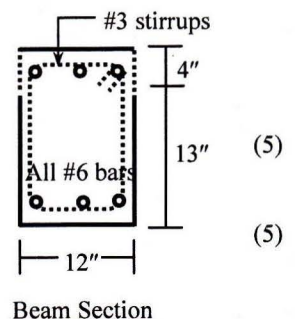


Fig. 3

4. (i) (a) Explain (with sketch) if it is safer for a person to sit down or stand up during an earthquake. (5)  
 (b) Explain if an engineer should be more concerned about magnitude or intensity of an earthquake.
- (ii) The peak ground acceleration (PGA) of an earthquake (of magnitude 6.0) is measured to be 3 m/sec<sup>2</sup> at a recording station. Calculate the (5)
  - (a) Epicentral distance of the recording station, using the Davenport (1972) equation
  - (b) PGA [using Milne & Davenport (1969)] at the epicentral distance calculated in (a).

### List of Useful Formulae for CE 423

\*  $Z = 279 \times 10^{-6} e^{(1.8M)/R_e^{1.64}}$  [Davenport (1972)]

$Z = 0.0069 e^{(1.64M)/\{1.1 e^{(1.1M)} + R_e^2\}}$  [Milne and Davenport (1969)]

\* Governing equation of motion of SDOF system for ground motion  $\Rightarrow m d^2u_r/dt^2 + c du_r/dt + k u_r = -m d^2u_g/dt^2$

\* For SDOF system,  $\omega_n = \sqrt{(k/m)}$ , and  $\xi = c/(2\sqrt{km})$

\* For lumped 2-DOF system

$$\begin{pmatrix} m_1 & 0 \\ 0 & m_2 \end{pmatrix} \begin{Bmatrix} d^2u_1/dt^2 \\ d^2u_2/dt^2 \end{Bmatrix} + \begin{pmatrix} c_1 + c_2 & -c_2 \\ -c_2 & c_2 \end{pmatrix} \begin{Bmatrix} du_1/dt \\ du_2/dt \end{Bmatrix} + \begin{pmatrix} k_1 + k_2 & -k_2 \\ -k_2 & k_2 \end{pmatrix} \begin{Bmatrix} u_1 \\ u_2 \end{Bmatrix} = \begin{Bmatrix} f_1(t) \\ f_2(t) \end{Bmatrix}$$

\* Eigenvalue problem (to calculate natural frequencies and modal vector)

$$[\mathbf{K} - \omega_{nr}^2 \mathbf{M}] = 0 \quad \text{and} \quad [\mathbf{K} - \omega_{nr}^2 \mathbf{M}] \phi_r = 0$$

\* BNBC 93

$V_b = (0.8) ZICW/R$ , where  $C = 1.25S/T_n^{2/3} \leq 2.75$

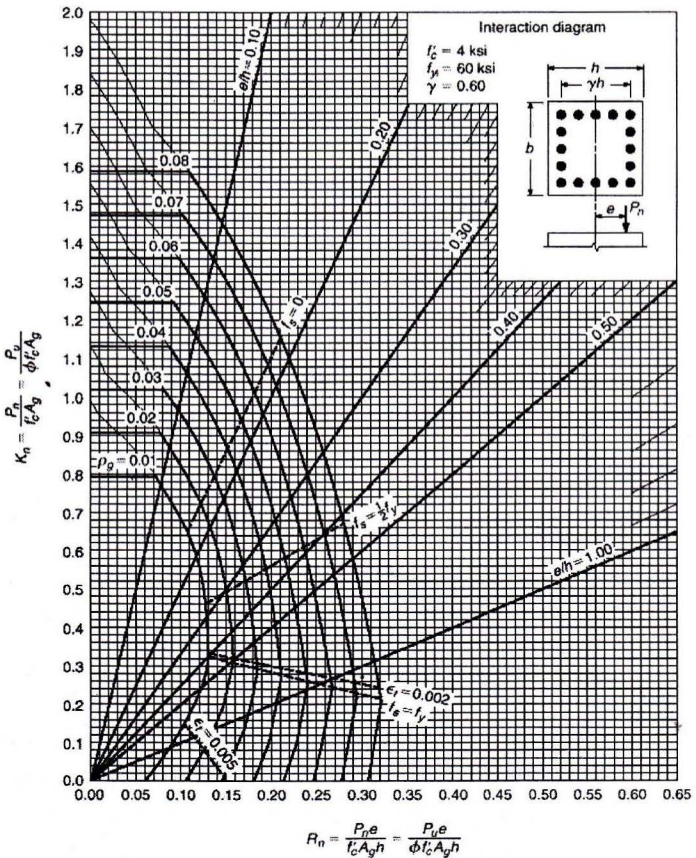
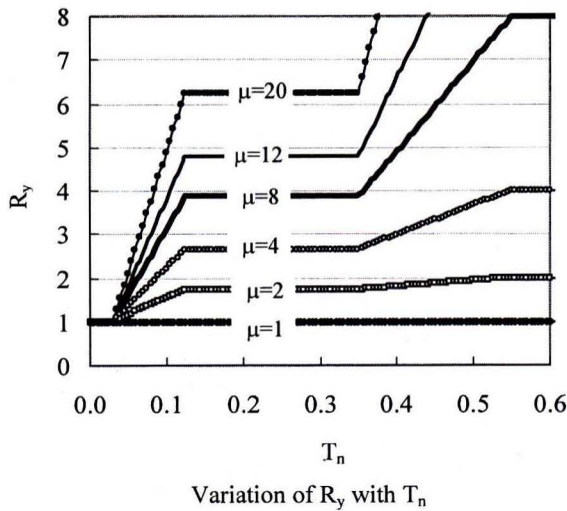
\* New BNBC

$V_b = (2/3) ZICW/R$ , where

$$\begin{aligned} C &= S [1 + (T_n/T_B) (2.5\eta - 1)] && \text{for } 0 \leq T_n \leq T_B \\ &= S (2.5\eta) && \text{for } T_B \leq T_n \leq T_C \\ &= S [(2.5\eta) (T_C/T_n)] && \text{for } T_C \leq T_n \leq T_D \\ &= S [(2.5\eta) (T_C T_D/T_n^2)] && \text{for } T_D \leq T_n \end{aligned}$$

Soil Type	S	T <sub>B</sub>	T <sub>C</sub>	T <sub>D</sub>
S <sub>A</sub>	1.20	0.15	0.40	2.00

\*  $R_y = f_0/f_y \quad \mu = u_m/u_y$



\* Kent-Park (1971) model

$\epsilon_0 = 0.002 \quad \epsilon_{50c} (= \epsilon_u) = \epsilon_{50u} + \epsilon_{50h}$   
with  $\epsilon_{50u} = (3 + 2f'_c)/(f'_c - 1) \times 10^{-3}$

$\epsilon_{50h} = 0.75 \rho_{st} \sqrt{(b_c/S)}$

where  $\rho_{st} = \text{Vol}_{st} / \text{Vol}_{con}$   
 $= 2(\bar{b}'' + h'') A_{st} / (b_c h_c S)$  for rectangular section

\* Shear vs. Flexural Failure

$V_{Des} \geq 1.4 (M_{u1} + M_{u2}) / L_n + V_{vert}$

\* Weak-Beam Strong-Column:  $\sum M_{c,ult} \geq 1.2 \sum M_{b,ult}$

\* Moderate seismic detailing of Columns

Tie Spacing,  $S_0 \leq 8d_b, 24d_{st}, b_c/2, 12''$

\* Special confining reinforcement ( $S_t \leq b_c/4, 4''$ )



**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2018**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Structural Engineering X (Concrete Technology)  
 Time: 1 hour

Course Code: CE 425  
 Full Marks: 40 (4 x 10)

*Answer all questions*

1. What is hydration of cement? Using schematic diagram, apply the knowledge to explain the rate of evolution of heat of Portland Cement. [3+7 = 10]  
 Or  
 List the advantages of using blended cement? Illustrate how pozzolanic reaction occurs in Portland Composite Cement? [3+7 = 10]
2. Calculate the Bogue compound contents ( $C_3S$ ,  $C_2S$ ,  $C_3A$ , and  $C_4AF$ ) of the following Portland cements (X, Y, and Z). Which of these cements is likely to be high heat cement and which one will give the higher strength of concrete? Justify your answer. [10]

Bulk Oxide Content	Percentage in Cement		
	X	Y	Z
CaO	66	55	66
SiO <sub>2</sub>	20	14	20
Al <sub>2</sub> O <sub>3</sub>	6.8	12	5.5
Fe <sub>2</sub> O <sub>3</sub>	3	15	4.5
MgO	1.3	1.1	1.4
SO <sub>3</sub>	2.2	0.1	0.2
K <sub>2</sub> O	0.2	0.2	0.4
Na <sub>2</sub> O	0.3	0.3	0.5
LOI	0.2	2.3	1.5

3. Using schematic diagram, discuss the mechanism for successful pumping concrete and how to improve the flow of fresh concrete. [10]  
 Or  
 Explain why is workability of concrete important? Based on your knowledge, what are the tests need to be carried out to measure the workability of concrete, illustrate one of them? [10]
- 4a. "The purpose of air entrainment in concrete is to protect concrete from cracks due to freezing and thawing cycles". Do you agree or disagree with this statement, justify your answer with a schematic diagram. [6+4 = 10]
- 4b. "The function of the retarder is to delay or retard the initial setting time of cement paste in concrete". Do you agree or disagree with this statement, justify with proper explanation.



**University of Asia Pacific**  
**Department of Civil Engineering**  
**Midterm Examination Spring 2018**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Environmental Engineering III  
Time: 1 hour

Course Code: CE 431  
Full Marks: 30

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**Answer any 2 (two) questions. Assume data if not available.**

1. (a) Draw the flow diagram showing all the functional elements of solid waste management system. [3]  
(b) Discuss the effects of poor management of solid waste from environmental view point. [6]  
(c) A cannery (where food/fruits are canned) receives on a given day: [6]
  - i) 12 tons of raw produce
  - ii) 5 tons of cans
  - iii) 0.5 tons of cartons
  - iv) 0.3 tons of miscellaneous materials.As a result of internal activity
  - i. 10 tons of product are produced, remainder discharged to a disposal facility
  - ii. 4 tons of cans are stored, remainder used
  - iii) 3% of cans used are damaged and incinerated, remainder used.
  - iv) 75% of miscellaneous materials become paper waste and incinerated, remainder is disposed of.Determine the generation rate of wastes.
  
2. (a) Explain the term "Integrated Solid Waste Management (ISWM)". [3]  
(b) What are the factors upon which the composition of solid waste depends on? Why is it necessary to know the composition of solid waste in solid waste management system? [3+3]  
(c) Calculate the size of a storage container with the following data: [6]

Number of population to be served = 75,000  
Average rate of waste generation = 1.0 kg/cap/d  
Weekly frequency of collection = 3.5  
Waste density = 150 kg/m<sup>3</sup>.  
Capacity margin = 50%.
  
3. (a) Write short notes on "Proximate Analysis of Solid Waste". [3]  
(b) Differentiate between hauled-container and stationary-container systems during collection phases of solid waste management. [6]  
(c) A transfer station handling 300 tons/day, 5 days per week, costs \$5 million to build and \$150000 per year to operate. An individual tractor-trailer costs \$140000 and carries 15 tons/trip. Operation and maintenance costs (including fuel) of the truck is \$50000/yr; the driver makes \$40000 per year (including benefits). The capital costs of the building and transfer trucks are to be amortized over a 10-yr period using a 12% discount factor. Suppose, it takes 30 minutes to make a one-way trip from the transfer station to the disposal site and 7 round trips per day are made. Find the cost of transfer station and haulage in dollars per ton. [6]

**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Semester Examination Spring 2018**  
**Program: B. Sc. Engineering (Civil)**

Course Title: Environmental Engineering IV  
Time- 1 hour

Course Code: CE 433  
Full marks: 50

There are **THREE** questions. Answer all the questions ( $20+15+15=50$ ).  
[Assume reasonable data if any]

1. (a) What are the adverse impacts of thermal pollution? (4)
- (b) List down the problems associated with "Suspended Solids" and "Nutrients" as water pollutants. (5)
- (c) River "Shurma" has a lot of Fish kill recently in addition to nuisance and significant odor. Identify the water quality variables that are to be checked. Which uses of this water should be prevented? (4)

**OR**

Point out the ways to detect pollution in a water body.

- (d) What are the principal factors controlling eutrophication? Outline how could the eutrophication process be reversed or slowed down? (7)

**OR**

A wastewater treatment plant discharges phosphorus through its effluent in a lake that has surface area of  $200 \times 10^6 \text{ m}^2$ . The effluent flow rate is  $0.5 \text{ m}^3/\text{s}$  and its phosphorus concentration is  $10 \text{ mg/L}$  ( $10 \text{ g/m}^3$ ). The lake is fed by a stream having  $30 \text{ m}^3/\text{s}$  of flow with no phosphorus. If the phosphorus settling rate is  $10 \text{ m/year}$  and the phosphorous concentration in the lake is  $0.053 \text{ mg/L}$ , what should be the loading of phosphorus to keep the average lake concentration below  $0.05 \text{ mg/L}$ ?

2. (a) Provide generic equations for aerobic and anaerobic decomposition processes respectively. (5)

**OR**

Which factors govern the self-purification of "organic waste" in a stream?

- (b) Demonstrate how the BOD rate equation can be derived. (4)

**OR**

Show the changes in the nitrogen species in polluted water under aerobic conditions in a figure.

- (c)  $\text{BOD}_5$  of a wastewater sample is  $350 \text{ mg/L}$  at  $20^\circ\text{C}$ . If  $k = 0.23 \text{ k/day}$  at  $20^\circ\text{C}$ , calculate  $\text{BOD}_5$  at  $25^\circ\text{C}$ . (6)



3. (a) What are the factors to be considered in choosing particular pollution control measures? (5)

OR

What are the sources of groundwater pollution?

(b) Which are the criteria air pollutants? Define AQI. (5)

OR

Define "primary air pollutants" and "secondary air pollutants". Provide examples.

(c) List down the effects of air pollution on vegetation and atmospheric properties. (5)

OR

What are the sources and effects of  $\text{NO}_x$  in urban environment?

### Given Formula:

$$\text{BOD}_m \cdot V_m = \text{BOD}_w \cdot V_w + \text{BOD}_d \cdot V_d$$

$$\text{BOD}_t = L_0 (1 - e^{-kt})$$

$$P = \frac{S}{Q + v_s \cdot A}$$

$$k_T = k_{20} \theta^{T-20}, \theta = 1.047$$

**University of Asia Pacific**  
**Department of Civil Engineering**

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**Mid-Term Examination**

**CE 439: Environmental Impact Assessment (EIA)**

**Spring Semester 2018**

**07 June 2018**

**Total Marks: 40**

**Duration: 1 Hour**

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Answer all the following questions:

1. The 27 principles laid down in the UN Conference on Environment and Development held in Rio de Janeiro in 1992 emphasizes sustainable development and international cooperation toward common environmental goals. What are the 10 important issues that these guiding principles primarily deal with?
2. Using a flow diagram show the relationship of environmental assessment process to conventional project cycle.
3. List the important "Aims and Objectives" of EIA. State the 3 core values inherent in EIA.
4. Prepare a neat "EIA Process Flowchart".



**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination**  
**Spring 2018 (Section B)**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Environmental Engineering VII  
Time- 1 hour

Course Code: CE 531  
Full marks: 50

**Answer all the following questions**  
**(Assume any missing value)**  
**Marks Distribution [20+10+10+10]**

1. Write down answers of the following questions. [10\*2=20]
- (a) Suppose the arc catalogue window is not visible in your arcmap project, from where you can get that back?
  
  - (b) Select the places which are within 200 m from Sumona Clinic. here which one is Target layer and which one is source layer?
  
  - (c) In which menu bar you will get the option Export map?
  
  - (d) Write down six Geo-processing operators.
  
  - (e) What are the components of GIS?
  
  - (f) Suppose the Table of contents window is not visible in your arcmap project, from where you can get that back?

(g)



Write down name of each tool.

(h)

Write few of the items you insert during preparing map.

(i)

How many ways you can select any feature?

(j)

Write down the path which may lead you towards saving a new shape file.

2. (a) From the point shape file, select the Sony Cinema hall. Select the places which are within 500 m from Sony Cinema hall. Create a new shape file of Schools from that and label the name of the schools. Is there any intersecting river around this area? [1+2+2+1+2]
- (b) Bangladesh waterways shape file is given. Categorize the different types of waterways. [2]
3. (a) Prepare a layer file of Gulshan drainage area. Shape files of Drainage network of Bangladesh and Gulshan thana are given. [4]
- (b) Soil pattern of Bangladesh (shape file) is given. Select the Dhaka district soil pattern and create a map of it. Export the map. [2+4]
4. (a) Road map of ward 35 has been given. You are being asked to build a new city where there cannot be any high rising building and the distance of the building from the tertiary roads should be as near as possible (for example you can take those buildings which are within 1m from the tertiary road) [7]
- (b) Thana bd shape file is given. Convert it to District bd shape file. [3]



**University of Asia Pacific**  
**Department of Civil Engineering**  
**Mid Term Examination**  
**Spring 2018**  
**Program: B.Sc. Engineering (Civil)**

Course Title: Environmental Engineering VII ↑  
Time- 1 hour

Course Code: CE 531  
Full marks: 50

**Answer all the following questions**  
**(Assume any missing value)**  
**Marks Distribution [20+10+10+10]**

1 Write down answers of the following questions

[10\*2=20]

- (a) Suppose the arc catalogue window is not visible in your ArcMap project, from where you can get that back?
- (b) Write down six Geo-processing operators.
- (c) What is choropleth map? Write down the steps of its formation.
- (d) Show the path of labels in GIS.

- (e) Show the path of Graduated symbols in GIS.
- (f) Where is the create Graph option in GIS.
- (g) What are the components of GIS?
- (h) Suppose you have the number of male, female and children.  
What should you do to get the total population?
- (i) You want to add particular location of some entities. What should be the add field type?
- (j) GIS deals with which kind of data?



2. Road map of ward 35 has been given. Prepare a shape file of Secondary road from the given file. Now select the buildings which are less than or equal to 12 storied. Classify the building according to their use. Label the building with storied number. Now due to some emergency incident you need to extend your secondary road by 10 m on each side. Do you think this decision will disturb the existing buildings (which you have selected) for this extension? [2+2+2+1+3]
3. (a) Soil pattern of Bangladesh (shape file) is given. Select the Chittagong district soil pattern and create a map of it. Export the map. [2+4]
- (b) Bangladesh waterways shape file is given. Categorize the different types of waterways, change the width and color of different types. Export the data. [2+1+1]
4. (a) Points shape file is given. Select the location Sumona Clinic. Select the places which are within 200 m from Sumona Clinic. Create a new shape file of Schools from that and label the name of the schools. Change the symbol of school. [3+1+1+1]
- (b) Thana bd shape file is given. Convert it to District bd shape file. [4]