4-2

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2016
Program: B.Sc. Engineering (Civil)

Course Title: Environmental Engineering VII | Course Code: CE 439
Time: 1 hour | Full Marks: 30

There are Four (4) questions. Answer any Three (3)

1.	(a)	Define EIA. Enlist the techniques to support the EIA process in recent years.	[5]
	(b)	Enlist the institutional arrangements and environmental agencies for EIA in Bangladesh and India.	[5]
2.	(a)	With a flow diagram explain the major steps of the EIA process.	[5]
	(b)	Why scoping and initial environment examination is required in an EIA process?	[5]
3.	(a)	Show a network diagram of pulp mill impacts.	[5]
	(b)	What are the major reasons of using checklists? Enlist the problems of using checklists.	[5]
4.	(a)	What are the steps in formulating mathematical modeling?	[5]
	(b)	Show a cause-effect network for atmospheric effects.	[5]

University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Fall 2016

Course Code: CE 425 — Time: 1 (one) Hour
Course Title: Structural Engineering X (Concrete Technology) — Full Marks: (5x8) = 40

Answer any 5 (five) questions

1. Describe how ground granulated blasfurnace slag (ggbs) is derived and describe its effects on concrete. Locate GGBS in ternary diagram.

2. Write short notes on any 3 of the following 'cements': i) Silica fume, ii) Metakaolin, iii) Rice Husk Ash, iv) Ground Recycled Glass, v) Cement Kiln Dust.

3. Draw a typical rate of heat evolution curve for Portland cement hydration. Using this diagram, explain the sequence of events during the first few days of cement hydration with respect to heat evolution.

4. What are the four major compounds in cement clinker? What roles do they play in cement hydration and strength development of concrete?

5. Fly ash is considered to be a *pozzolanic* material. Explain what is meant by this term. Why is fly ash in concrete useful at resisting chloride ingress?

6. Define Self Compacting Concrete. How SCC differs from conventional concrete? What are the potential benefits and limitation of SCC?

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination-Fall 2016
Program: B.Sc. Engineering (Civil)

Course Title: Structural Engineering VI (Design of Steel Structures) Time: 1 hour
Course Code: CE 417 Full Marks: 60

[Answer any three (03) questions out of four (4) questions]

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. E=29,000 ksi. (14)
Member is assumed fixed-pinned in both axes. Use AISC-ASD method.
Possible sections are given below.

Size	Ag (in^2)	r_x (in)	r_y (in)
W 12x40	11.7	5.13	1.94
W 10x45	13.3	4.32	2.01
W 12x50	14.6	5.18	1.96

(b) What is residual stress? What are the effects of residual stress on stress-strain relationship of a steel member? (06)

2. Determine the load capacity in tension for an L (4 x 4 x 3/8) section of A36 steel connected with 5/8" diameter bolts in standard holes as shown in the figure 1 on the next page. $\bar{x}$= 1.13 in. Calculate reduction coefficient (U) using equation method. Use AISC-ASD method. (20)

3.(a) Define i) Fatigue ii) Toughness iii)Ductility iv)Strain aging (10)

(b) Explain shear lag. (4)

(c) List advantages of steel structures as a building material. (6)

4. The residual stress for a 18 x 2 inch plate to be used as a tension member is shown in Fig. 2 . Derive the equation for stress-strain behavior in tension of the plate. Given: Fy= 36 ksi, E= 30,000 ksi. (20)

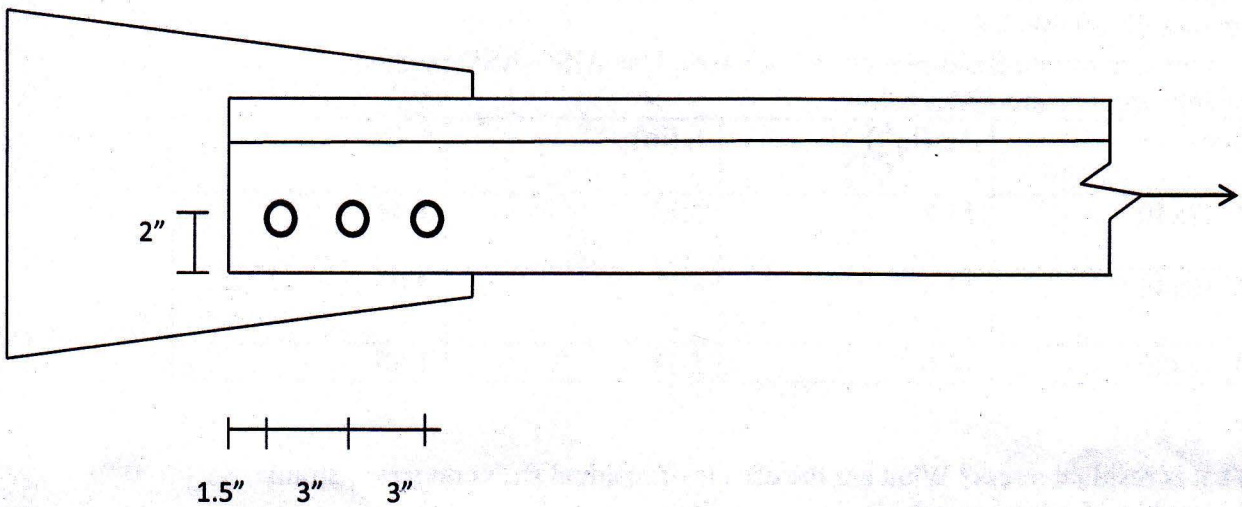

Figure 1.

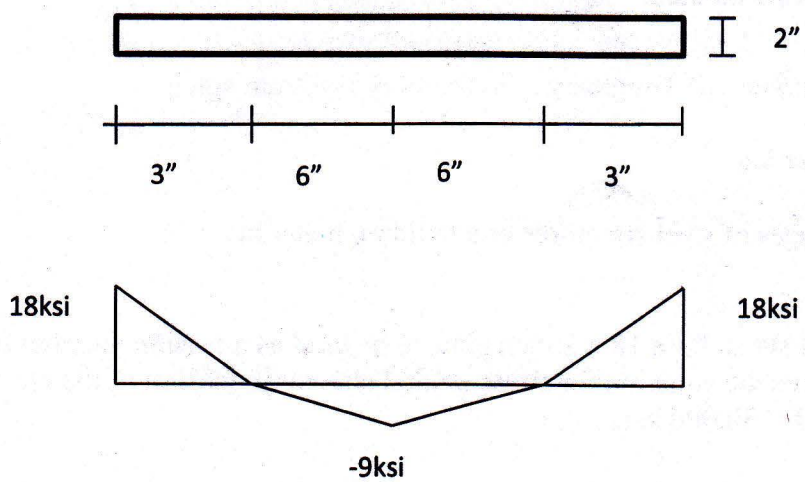

Figure 2.

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2016
Program: B. Sc. Engineering (Civil)

Course Title: Environmental Engineering IV | Course Code: CE 433
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*2 = 50)*

1. (a) Define Environmental pollution. List the principal sources of the following pollutants : (2+4)
i) Salts and ii) Toxic metals

(b) Show in a schematic, the zones of pollution and the change in aquatic ecology in a stream by wastewater disposal. (5)

(c) Discuss the impacts of thermal stratification on the dissolved oxygen in a lake. (4)

(d) 20 mL wastewater is mixed with dilution water to fill 300 mL BOD bottle. The drop of DO after 5 days is 4.8 mg/L. For a BOD bottle filled with only dilution water, DO drop is 1.2 mg/L after 5 days. Again, the total concentration of organic and ammonia nitrogen in wastewater is 4.0 mg/L. If $k = 0.21\ d^{-1}$ at 20°C, estimate the ultimate strength of the sample. (10)

2. (a) Write short notes on i) Persistence Organic Pollutants ; ii) Factors controlling eutrophication. (6)

(b) Discuss various pollution control measures to prevent water pollution. (6)

(c) Define critical DO. What is the significance of critical DO? (3)

(d) Consider a lake with $200 \times 10^6\ m^2$ of surface area for which the only source of phosphorus is the effluent from a wastewater treatment plant. The effluent flow rate is $0.45\ m^3/s$ and its phosphorus concentration is 10.0 mg/L (= 10.0 g/m^3). The lake is also fed by a stream having $30\ m^3/s$ of flow with no phosphorus. If the phosphorus settling rate is estimated to be 10 m/year, (10)
   (a) Estimate the average phosphorus concentration in the lake.
   (b) What level of phosphorus removal at the treatment plant would be required to keep the average lake concentration below 0.010 mg/L?

3. (a) Describe a simple phosphorus model for a lake. (5)

(b) Why is cBOD not equal to COD? Discuss the type and treatability of the waste for the (6)

following case.

BOD/COD = 0.8 ; ii) BOD/COD = 0.3

(c) What are the adverse impacts of heavy metals? (5)

(d) Define "waste assimilation capacity" of streams. What are the various forces that help in this process? List the factors on which the self-purification of oxygen demanding wastes depend on. (2+3+4)

Given Formula:

$BOD_m \cdot V_m = BOD_w \cdot V_w + BOD_d \cdot V_d$ $BOD_t = L_0 (1 - e^{-kt})$

Ultimate NBOD = 4.57 * TKN ~ 4.6* TKN

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

$$D = \frac{k_d L_0}{k_r - k_d}\left(e^{-k_d t} - e^{-k_r t}\right) + D_0 e^{-k_r t}$$

$$k_r = \frac{3.9u^{1/2}}{H^{3/2}} \qquad t_c = \frac{1}{k_r - k_d}\ln\left[\frac{k_r}{k_d}\left(1 - \frac{D_0[k_r - k_d]}{k_d \cdot L_0}\right)\right]$$

$$D_{max} = \frac{k_d L_0}{k_r - k_d}\left(e^{-k_d t_c} - e^{-k_r t_c}\right) + D_0 e^{-k_r t_c}$$

$DO_{(sat)} = 14.62 - 0.39\ T + 0.007714\ T^2 - 0.0000646\ T^3$

$k_{d\ (at\ T°C)} = k_{20°C} \cdot (1.047)^{T-20}$, $k_{r\ (at\ T°C)} = k_{r20°C} \cdot (1.024)^{T-20}$

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2016
Program: B.Sc. Engineering (Civil)

Course Code: CE 421 **Time: 60 Minutes**
Course Title: Structural Engineering VIII **Credit Hour: 2.0** **Full Marks: 3 x 20**

ANSWER ALL QUESTIONS. *The figures are not drawn to scale.* Any missing data can be assumed reasonably.

[1] Answer the followings

a) What is natural frequency and period? Assume a dynamical response is given by $x(t) = P_0\cos(\omega t)$ and you are asked to vary P_0 and ω. Explain the impact of P_0 and ω independently with appropriate sketch. **(8)**

b) Derive and solve the equation of motion of a damped SDOF system? Estimate the velocity of the SDOFs by considering that the system is under damped and it has a mass of 100 kg, stiffness 12000 N/m and the system has 4% damping? **(12)**

[2] Determine the acceleration equations of the dynamical system shown in Figure 1. Calculate the acceleration of the system for time steps t = 0.1 sec. Assume $m = 100$ Kg, $k = 1500$ N/m, system has 4% damping, use the initial conditions are, $x(0) = 0$, $\dot{x}(0) = 0$. **(20)**

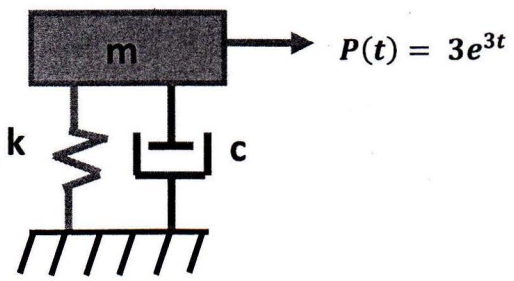

Figure 1

[3] Why the Newmark-Beta Method is necessary? Assume a dynamical system has mass, $m = 10$ Kg, stiffness, $k = 750$ N/m, and system has 5% damping and applied load is given by $\boldsymbol{P(t) = t^3 + 3e^{3t}}$. Use the initial condition (if necessary) as follows, $t = 0$, $\emptyset = 0$, $x(0) = 0$, $\dot{x}(0) = 0$. Determine the displacement and velocity and acceleration by using Newmark-Beta Method ($\alpha = 0.5, \beta = 0.25$) for time-steps $t = 0, 0.1$, where $dt = 0.05$. **(20)**

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Mid Term Examination Fall 2016
Program: B.Sc. Engineering (Civil)

Course Title: Professional Practice and Communication — Course Code: CE 403
Time- 1 hour — Full marks: 30

Answer any 3 from the following questions

1. a. Define Project. Explain Scope-Schedule-Budget Triangular relationship. (2+3)
   b. Describe Project Characteristics. (5)

2. a. What do you mean by Indemnification? (2)
   b. How do you describe Civil Engineering (CE) as a profession from the aspects of 'Systematic Body of Theory' and 'Culture'. (3)
   c. Describe 'Multiple Contract', 'Model Contract' and 'Purchase Orders' forms of Contract. (5)

3. a. Name six elements of Contract. (2)
   b. What do you understand by 'Payment Bond' and 'Performance Bond'. (3)
   c. What is Fiduciary Risk? How do you manage Fiduciary Risk? (5)

4. a. Name four ways to manage Risk. (2)
   b. Explain in your words 'Notice of Breach' and 'Curing a Breach'. (3)
   c. Write down the aspects inquired by the surety company before issuing a bond? (5)

University of Asia Pacific
Department of Civil Engineering
Mid-term Examination Fall 2016

Course Code: CE 415 — Time: 1 (One) Hour
Course Title: Structural Engineering V — Full Marks: 50

There are 3 questions in this section. Answer any 2 (Two).
Assume reasonable values for any missing data

1. (a) What is the basic difference between the internal couple of a prestressed and a reinforced beam section? 4

   (b) What is the difference between partial and full prestressing? 3

   (c) Compute the value of the live load that the beam of Fig. 1 can carry without producing crack at the bottom of Sec 1-1. Given: $f_r = 400$ psi; $n = 7$ and Effective prestress = 820 kN 18

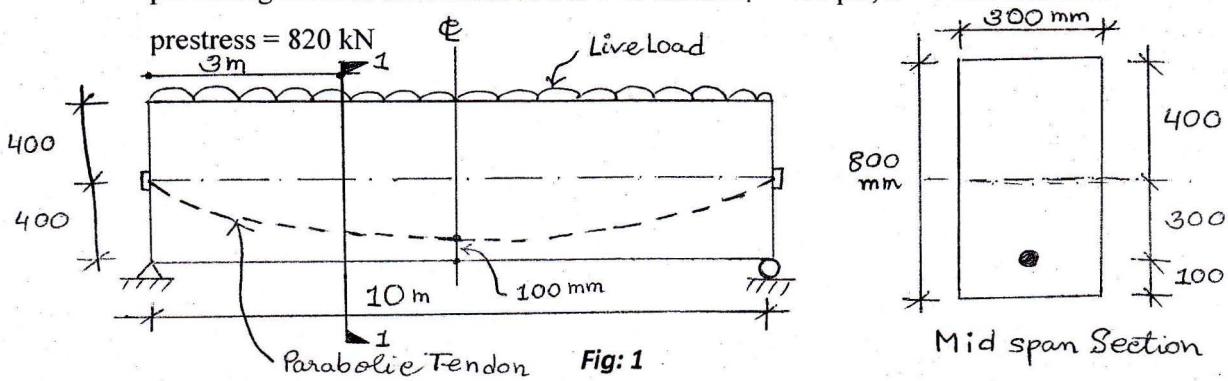

Fig: 1

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

   (b) Compute the loss of prestress in steel at sec 2-2 of Fig. 2 due to elastic shortening. The prestress in steel at transfer is 1020 MPa. Given: 20

$A_{ps} = 650\ mm^2$; $E_s = 2 \times 10^5$ MPa;

$E_c = 2.5 \times 10^4$ MPa; $f'_{ci} = 35$ MPa

Neglect the self-weight of the beam.

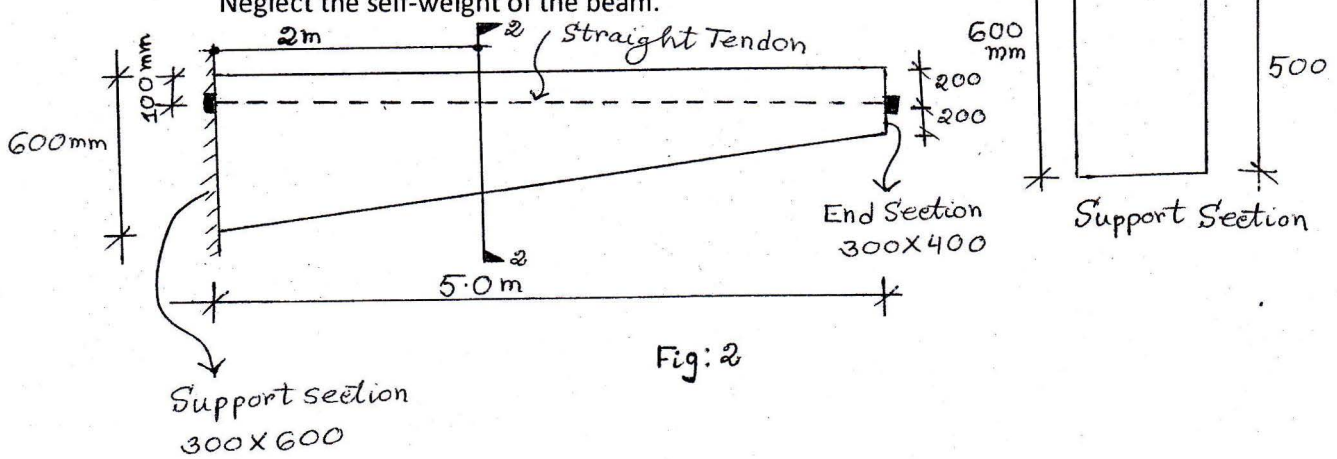

Fig: 2

3. (a) Describe briefly the different stages of loading to which a prestressed concrete member is often subjected. 7

(b) The pretensioned T-beam shown in Fig.3 has a prestressing steel area of 2.0 in^2. The c.g. of steel is 3 inch above the bottom surface of beam. Given: 18

n =7; f'_{ci} = 4 ksi ; f'_c = 5 ksi ; f_{si} = 135 ksi ; f_{se} = 100 ksi ; M_G = 45 kip-ft ; M_L = 100 kip-ft

Using the transformed section, compute the extreme fibre stress and compare with ACI allowable stresses.

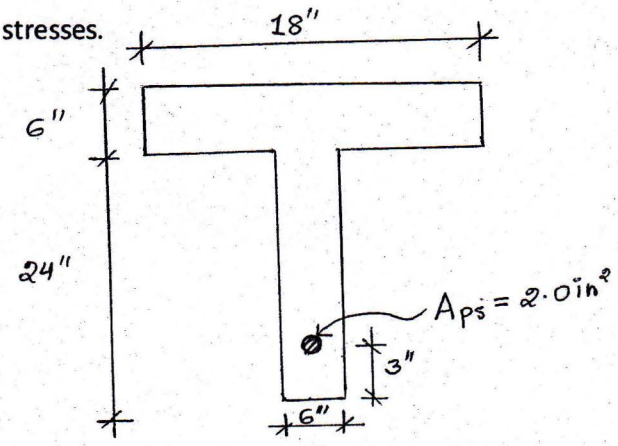

Fig: 3

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2016
Program: B. Sc. Engineering (Civil)

Course Title: Environmental Engineering III — Course Code: CE 431
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*2 = 50)*

1. (a) What are the objectives of solid waste management? Which factors dictate the nature and abundance of solid waste? (2+4)

(b) Why is it important to know the composition of solid waste? Mention the physical and chemical properties of solid waste that are important to evaluate. Also mention the analytical methods for the chemical properties. (2+5)

(c) Using the data for total energy values given in the table, estimate the energy of the remaining solid wastes if 60% of cardboard, 50% of the paper and 75% of plastics is recovered by the homeowner. Estimate the % (decrease or increase) change in total energy per unit weight of waste after recovery based on 100 kg of waste. (12)

Constituent	Food waste	Paper	Newsprint	Card board	rubber	Plastics
Weight (%)	32.5	35	12	6	5.5	9
Total Energy, (kj)	628,615	527,520	88,305	61,460	20,688	78,573

2. (a) What is the significance of source reduction? Mention the key strategic options for source reduction with examples that can be applicable in Bangladesh. (2+4)

(b) Discuss the hauled and stationary container systems with figures. (6)

(c) For a stationary container system, 25 numbers of containers are emptied per trip, each having a volume of 3.75 m^3. The container utilization factor and collection vehicle compaction ratio are 0.8 and 2.75 respectively. Determine the approximate truck capacity. (5)

(d) Estimate the overall moisture content and energy content of a solid waste with the following composition (8)

Component	% by Mass	Moisture Content (%)	Energy Content (KJ/Kg)
Paper	31.5	4.2	16900
Plastics	10.2	2.3	31300
Wood	4.6	18.7	19800
Textiles	8.8	9.5	18100
Leather	7.6	10.2	16800
Rubber	5.2	1.9	23400
Metals	12.1	1.3	27000
Food waste	13.6	82	4200
Miscellaneous	6.4	3.4	600

3. (a) Mention the activities that are involved in the collection and transfer part of solid waste management. (4)

(b) Discuss different aspects of the waste collection systems that are classified according to the availability of services. What are the benefits of having a transfer station? (5+3)

(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. **Use graph paper for the plot.** (13)
Assume the following data while calculating:
Transportation cost:
Stationary container system using an 18 m^3 compactor: BDT 2000/ hr
Tractor-trailer transport unit with a capacity of 120 m^3: BDT 2500/ hr
Other costs:
Transfer station operating cost: BDT 40/m^3
Extra cost for unloading facilities: BDT 5/m^3
Other data:
Density of wastes in compactor = 350 kg/ m^3
Density of wastes in transport unit = 160 kg/ m^3

Given Formula:

Energy Content (KJ/Kg) = 338.2C+1430 (H-O/8) + 95.4S

Haul Container System	Stationary Container System
$T_{hcs} = (PT_{hcs} + q + m + nx)$ $PT_{hcs} = pc + uc + dbc$ $Md = \{(1-W)L - (t_1 + t_2)\} / Thcs$	$T_{scs} = (PT_{scs} + q + m + nx)$ $PT_{scs} = C_t uc + (S-1)(dbc)$ $C_t = \frac{V_v z}{V_c f}$ $M_{dc} = \frac{V_d}{V_v z}$ $L = \frac{(t_1 + t_2) + M_{dc}(PT_{scs} + q + m + nx)}{1 - W}$