



University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2021
Program: B.Sc. Engineering (Civil)

Course Title: Professional Practices and Communication
Time: 1 Hour

Credit Hours: 2.00

Course Code: CE 403
Full Marks: 40

Answer all the questions.

1. Do you think that a project is a one-time, once-off activity, never to be repeated exactly in the same way again? Justify your answer in terms of Project Characteristics. [10]

2. Consider the situation below: [10]

A company sent out a public announcement requesting proposals for a specific project. This public announcement — known as Request for Proposals (RFP) — had been issued through websites, emails, social media, newspapers, and trade journals. Firms or individuals interested in the project then wrote proposals in which they summarized their qualifications, project schedules and costs, and discussed their approach to the project. The recipient of all these proposals then evaluated them, selected the best candidate, and then worked up a contract.

Which type of project proposal is appropriate for the above circumstances? Explain briefly to justify your answer.

3. Suppose you have a Civil Engineering Consulting firm where you do design of R.C.C. buildings and hire contractors for implementing those. Last month you got an offer from a client to build a 1000 sqft duplex building in Cox's Bazar area (Coastal region of Bangladesh). Usually you practice Unit Price type of contract for civil construction works. But this time one of your familiar contractor, who works at coastal area, is instigating you to go for a Fixed Price (Lump Sum) contract with him for this project. Based on relative comparison between Fixed Price (Lump Sum) and Unit Price Contract, which type of contract will you accept? Why? [10]

4. Define Conditions of Contract. Distinguish between General Conditions of Contract (GCC) and Particular Conditions of Contract (PCC). [3+7]

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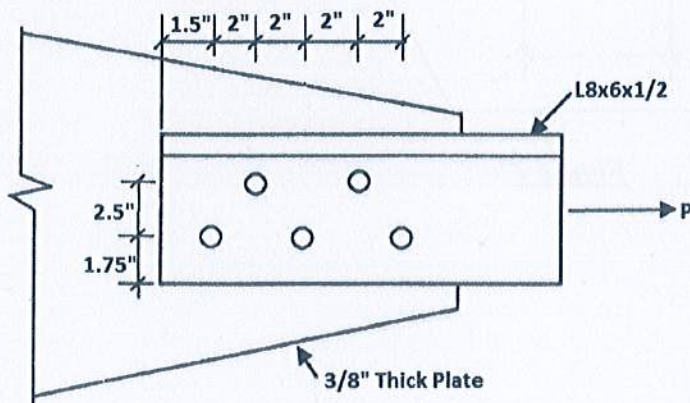
Course Title: Structural Engineering VI
 Time: 1 hour

Credit Hour: 2

Course Code: CE 417
 Full Marks: 60

QUESTION 1

Determine the tension capacity (P) of the angle L8x6x1/2 attached to a 3/8-inch-thick gusset plate with the bolt configuration shown in Figure 1. The short leg of the angle is connected to the gusset plate. Consider all limit states, and assume uniform tension stress. [20]
 The material is A36 ($F_u = 58$ ksi) steel and bolts are 7/8-inch dia. with standard holes. Use ASD approach.



Section properties of L8x6x1/2:

A_g (in ²)	\bar{x} (in)	\bar{y} (in)	k (in)
6.80	1.46	2.46	1

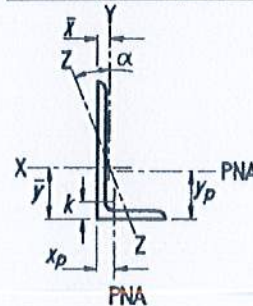


Figure 1

QUESTION 2

- (i) Compare between rivets and bolts as structural fasteners. Which one is more advantageous? Justify your opinion. [3+2]
- (ii) Explain the philosophy of reducing live loads in a multi-storied building? [3]
- (iii) What is shear lag effect in a tension steel member? Explain with a neat sketch. How does the AISC incorporate the effect of shear lag in the design of tension member? [3+2]
- (iv) Define residual stress. Compare the stress-strain diagrams of a steel plate member with and without the residual stress. Discuss the effect of residual stress on a steel member. [2+3+2]

QUESTION 3

Use the elastic (vector) method to compute the shear forces on bolts in the eccentrically loaded bolt group shown in the figure below. If the fasteners are 1-inch-diameter A449 ($F_{by} = 90$ ksi, $F_{bu} = 120$ ksi) bolts, check whether the bolts are adequate to resist the maximum shear. Assume single shear plane for the calculation, and follow ASD approach. [20]

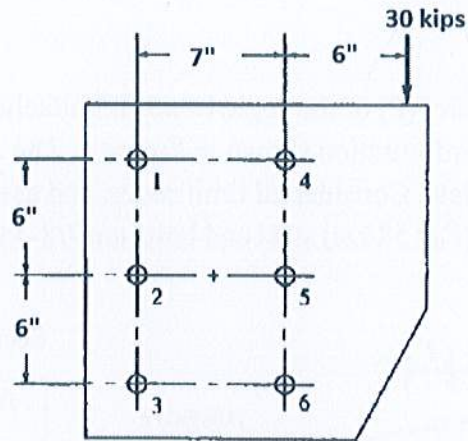


Figure 2

Formula

$$1. R_n = 0.6F_y A_{gv} + U_{bs} F_u A_{nt}$$

$$2. R_n = 0.6F_u A_{nv} + U_{bs} F_u A_{nt}$$

$$3. R_n = m A_b F_{nv}$$

$$4. R_x = \frac{My}{\Sigma d^2} \text{ and } R_y = \frac{Mx}{\Sigma d^2}$$

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2021
Program: B. Sc. Engineering (Civil)

Course Title: GIS and Remote Sensing
Time: 1.00 Hour

Course Code: CE 531A
Full Marks: 40

Answer the following questions
[Marks distribution: 15+15+10=40]

1. (a) You have been given a map of Annual Mean Rainfall of Bangladesh. Rebuild the map by yourself, incorporating the map legend. What are the steps you have to take to complete this task? After completing the whole map, your senior wanted to check the accuracy level of your work. How will you convince him of your efficiency upon the completion of the task? [5+5]
- (b) Create a shape file of the country that starts with the first letter of your first name using Google Earth and ArcGIS. [5]
2. (a) Prepare a layer file of Mohammadpur Thana drainage area. Shape files of Drainage network of Bangladesh and Mohammadpur thana are given. Find out the total drainage length of that particular area. Show the drainage line according to the field type L-poly in the map and do necessary labeling. [7.5]
- (b) From the point shape file select "Westin Hotel Dhaka". Select the places which are within 1800 m from "Westin Hotel Dhaka". Are there any bus-stop situated in the selected area? Find the distance from the closest one. [7.5]
3. (a) Classify the different types of the road from the area that starts with the first letter of your first name (Select the area from the given shape file) area and find out the total coverage (perimeter) of the individual categories. [5]
- (b) Category the different types of location from the 'Places shape' file, and find out the total area coverage of each type. [5]

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2021
Program: B. Sc. Engineering (Civil)

Course Title: GIS and Remote Sensing
Time: 1.00 Hour

Course Code: CE 531B
Full Marks: 40

Answer the following questions
[Marks distribution: 15+15+10=40]

1. (a) You have been given a map of Annual Mean Rainfall of Bangladesh. Rebuild the map by yourself, incorporating the map legend. What are the steps you have to take to complete this task? After completing the whole map, your senior wanted to check the accuracy level of your work. How will you convince him of your efficiency upon the completion of the task? [5+5]
- (b) Create a shape file of the country that starts with the last letter of your last name using Google Earth and ArcGIS. [5]
2. (a) Prepare a layer file of Gulshan Thana drainage area. Shape files of Drainage network of Bangladesh and Gulshan thana are given. Find out the total drainage length of that particular area. Show the drainage line according to the field type L-poly in the map and do necessary labeling. [7.5]
- (b) From the point shape file select "Dhaka Zoo". Select the places which are within 1800 m from "Dhaka Zoo". Are there any bus-stop situated in the selected area? Find the distance from the closest one. [7.5]
3. (a) Classify the different types of the road from the area that starts with the first letter of your first name (Select the area from the given shape file) area and find out the total coverage (perimeter) of the individual categories. [5]
- (b) Category the different types of building according to their use from the 'Building structure' shape file, and find out the total area coverage of each type. [5]

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2021
Program: B.Sc. Engineering (Civil)

Course Title: Structural Engineering X
Time: 1 hour

Credit Hour: 2.0

Course Code: CE 425
Full Marks: 40

QUESTION 1

A very thick RCC raft foundation needs to be constructed for a nuclear power plant. Three types of cement (A, B and C) have been chosen and technical data sheets are collected to pre-investigate the performance of cement in order to find suitable concrete for that construction. Chemical compositions of cement are determined by X-ray fluorescence and presented in Table 1.

Table 1: Chemical constituent of cement (A, B and C)

Bulk Oxide Content	CaO	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	SO ₃	K ₂ O	Na ₂ O	LOI
A	62	20	11.5	2.8	1.2	0.1	0.1	0.4	1.9
B	65	20	7.5	4	1.3	0.3	0.3	0.5	1.1
C	63	23	7.5	2.5	1.1	0.1	0.6	0.6	1.6

(i) Find the cements that will provide higher heat and higher strength of concrete and then explain the impact of those cements on the performance of concrete. [12]

(ii) Based on the alumina modulus and Bogue analysis, propose a suitable cement for the raft foundation of nuclear power plant and justify your selection. [6]

QUESTION 2

With the help of a neat sketch, describe the working mechanism of superplasticizer. Discuss the effect of using different percentages of superplasticizers on the strength development of concrete. [4+4]

QUESTION 3

What is segregation of concrete? What are the causes of segregation of concrete and the effects of the segregation on concrete performance? [2+6]

QUESTION 4

What is pozzolanic reaction? Why do pozzolanic materials improve the strength and durability of concrete? Explain. [3+3]

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2021
Program: B.Sc. in Civil Engineering

Course Title: Prestressed Concrete
Time: 1 hour

Course Code: CE 415

Credit: 2.0
Full Marks: 50

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

1. (a) What are the differences between bonded tendon and unbonded tendon in prestressed concrete? (5)
- (b) State the advantages of prestressed concrete over reinforced concrete. (5)
- (c) A Prescon cable, 15 m long, is to be tensioned from one end to an initial prestress of 1035 MPa immediately after transfer. If the shrinkage of concrete is 0.0002 at time of transfer, average compression in concrete is 5.5 MPa along the length of the tendon, $E_c = 26,000$ MPa, $E_s = 200,000$ MPa, compute the length of shims required neglecting any elastic shortening of the shims and any friction along the tendon. Assume that there is no slack in the cable. (10)
2. A posttensioned beam has a midspan cross section of 250 mm by 375 mm with a duct of 60 mm by 90 mm to house the wires, as shown in the Figure 1. It is prestressed with 500 mm² of high-tensile steel wire to an initial stress of 1035 MPa. The c.g.s. is 100 mm above the bottom fiber. If the stress is reduced by 5% immediately after transfer due to anchorage loss and elastic shortening of concrete, what will be the stresses in the concrete at transfer? Solve the problem following an exact theoretical solution. (18)

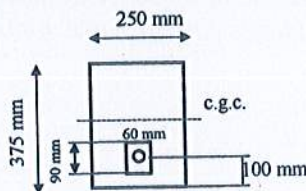


Figure 1

3. A pretensioned simple beam with a cross section of 20 inch by 30 inch on a span of 30 ft carries a uniform load of 3.5 k/ft including its own weight, as shown in the Figure 2. The beam has a parabolically curved tendon located 10 inch above the bottom fiber that produces an effective

prestress of 350 k. Compute extreme fiber stresses in the concrete at the midspan section by the method of load balancing and show the stress distribution. (12)

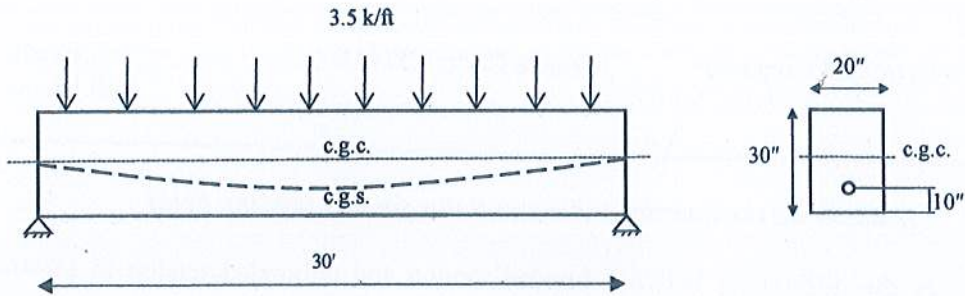


Figure 2

Formula

$$1. \Delta_s = \frac{f_s \times L}{E_s}$$

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2021
Program: B. Sc. Engineering (Civil)

Course Title: Environmental Engineering IV
 Time- 1 hour

Course Code: CE 433
 Full marks: 40

Answer all the questions Assume reasonable data if any

1. Consider the case of river Buriganga, state what water quality parameters you would check as an environmental engineer before treating the water and describe some actions that can be taken to reverse or control the existing pollution. [10]
2. As an engineer, describe the effects and necessary protective actions if the following parameters in discharged wastewater into another water body exceed the prescribed limit or just be present- [10]
 - a) Pathogen
 - b) Calcium and magnesium ions
 - c) POC
3. a) Explain the effect of temperature on DO sag Curve. [5]

b) A lake receives an effluent flow of 0.6 m³/s with P-concentration of 20 mg/L and there is another influent stream of 30 m³/s with no phosphorous with average Phosphorous concentration in the lake being 0.15 mg/L. Determine the surface area of the lake. If V_s= 15m/yr and the treatment plant efficiency is 87%, determine the new P-concentration in the lake. [5]
4. A municipal wastewater treatment plant (Q_w = 17000 m³/d and T = 23°C) discharges 0.15 m³/s of treated effluent having BOD₅ of 70 mg/L and DO of 3 mg/L into a stream (Q_T = 0.9 m³/s and T = 22°C) that has a BOD₅ of 7 mg/L and DO of 11 mg/L. Again, the total concentration of organic and ammonia nitrogen in wastewater is 4.7 mg/L The deoxygenation constant for the mixture of river water and wastewater k_d is 0.24/day and the nitrogenous deoxygenation rate constant k_n is 0.26/day . The stream has a depth of 3m and the average stream velocity is 0.4 m/s. Estimate DO_{min}, x_c, t_c and draw tentative DO- sag curve with proper identifications. [10]

$$\text{Ultimate NBOD } L_n = 4.57 * \text{TKN} \sim 4.6 * \text{TKN}$$

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

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

$$D_{\max} = \frac{k_d L_0}{k_r - k_d} (e^{-k_d t_c} - e^{-k_r t_c}) + D_0 e^{-k_r t_c} \quad D_c = \frac{1}{k_r} (k_d L_0 e^{-k_d t_c} + k_n L_n e^{-k_n t_c})$$

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