Course Title: Professional Practices and Communication   Course Code: CE 403
Time: 1 Hour   Credit Hours: 2.00   Full Marks: 40

Answer all the questions.

1. "If you are going to ask for something to be delivered faster (Schedule), you have   **[10]**
   to pay more (Budget). If you are trying to save some money (Budget), sometimes
   you can do this by choosing a simpler version (Scope)."

   How the Scope-Schedule-Budget triangular relationship of a project is reflected in
   the above testimony? Explain in your own words.

2. "A project proposal does more than just secure grants." To what extent do you   **[10]**
   agree or disagree with the quoted statement? Beyond securing grant, what are the
   other purposes of writing Project Proposal?

3. Consider the situation below: **[10]**

   Mr. 'X' is interested in doing a project at his office (for example, investigating the
   merits of bringing in some new technology to increase productivity). Mr. 'X' met
   with his Supervisor and tried to convince him/her of this. The Supervisor might
   respond by saying, "Write me a proposal and I will present it to upper
   management."

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

4. Even though Purchase orders are designed primarily to purchase materials and are   **[10]**
   not really appropriate for professional engineering services, sometimes clients use
   Purchase orders to hire Civil Engineers. In which circumstances does the clients
   use Purchase orders to hire Civil Engineers? As a Civil Engineer, what should you
   do if you get such an offer? Explain briefly in context to Public Contract Code.

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Course Title: Environmental Engineering VII

Course Code: CE 531

Time- 1hour

Full marks: 40

Part -01
Answer the following questions

1. Write down answers of the following questions. (6*1=6)

   [Not more one line]

   (a) Suppose the arc catalogue window is not visible in your Arc-Map project, from where you can get that back?

   (b) How many ways you can select any feature?

   (c) In which menu bar you will get the option Export map?

   (d) ⊕ ⊖ ✋ ◯ ✖ ✖

      Write down name of each tool.

   (e) Suppose the Table of contents window is not visible in your Arc-Map project, from where you can get that back?

   (f) What is meant by unbounded data?

2. What is GIS? Write down the Disciplines & Technologies connected to GIS? Why is GIS important? (3)

3. Show the Concept of Vector and Raster data type with a diagram. (3)

4. Describe the classification of "Special Data" types along with example. (3)

Part -02
Answer all the following questions

5. Insert shape file of administrative area of country "C". Change the color of the polygon into orange. No outline color . Insert the land cover grid map of country "C". Change the transparency of grid map to 50%. Insert rail, roads and water areas. Change the symbol of rail to railroad, change the symbol of road to major road, change the color of the polygon of water areas to blue.   (5)

    Country "C" = You will be given the instruction during the exam period.

    Please follow the link given below for downloading
    [LINK: Spatial Data Download | DIVA-GIS]

6. Prepare transportation map of the country "C"   (5)

7. Insert the administrative area of the country "C"
    Classify the different types of rail system of country "C" with respect to EXS-DESCRI. [uncheck all other values option] Classify the different types of road   (5)
    system in country "C" with respect to RTT-DESCRI. [Uncheck all other values option]

8. Insert water areas of country "C". Select South the river "R". Prepare a layer for the river. Change the color of the river. label it.
                                                                                          (5)
    River "R" = Any river starts with the first letter of your name.

9. Prepare a shape file of country "D" using Google earth Platform
                                                                                          (5)

    Country "D" = You will be given the instruction during the exam period.

Course Title: Structural Engineering X

Course Code: CE 425

Time: 1 hour

Credit Hour: 2

Full Marks: 40

QUESTION 1

With the help of a neat sketch, describe the mechanism of concrete pumping. What are the factors that affect pumpability of concrete? [4+4]

QUESTION 2

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

QUESTION 3

What is workability of concrete? What are the factors affecting workability of concrete? How to improve the workability of concrete? [2+6]

QUESTION 4

A thick gravity dam structure needs to be constructed. 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	67	18	8.5	3	1.3	0.3	0.3	0.4	1.2
B	62	20	11.5	2.8	1.2	0.1	0.1	0.5	1.8
C	65	21	7.0	3.0	1.1	0.1	0.6	0.7	1.5

(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 dam and justify your selection. [6]

Course Title: Structural Engineering VI	Course Code: CE 417
Time: 1 hour Credit Hour: 2	Full Marks: 60

QUESTION 1

A 13 ft long A36 (F_u = 60 ksi) steel tension member needs to resist a service dead load of 60 kips and a service live load of 140 kips. Select the lightest channel section from the following table to resist the loads. The tension member is connected to a gusset plate using 5 nos. 7/8 -in bolts with standard holes as shown in **Figure 1**. Neglect block shear failure mode and follow **AISC-ASD** method. Assume that the gusset plate has adequate strength in tension and U = 0.75. **[20]**

Shape	A_g (in^2)	r_x (in)	r_y (in)	t_f (in)	t_w (in)
C12x25	7.34	4.43	0.779	0.501	0.387
C15x50	14.7	5.24	0.865	0.650	0.716
C15x33.9	10.0	5.61	0.901	0.650	0.400
C15x40	11.8	5.43	0.883	0.650	0.520
C12x30	8.81	4.29	0.762	0.501	0.510

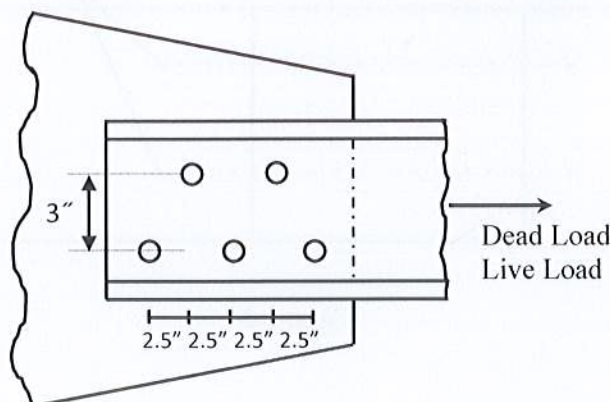
3″

Dead Load
Live Load

2.5″ 2.5″ 2.5″ 2.5″

Figure 1

QUESTION 2

(i) Explain the philosophy of reducing live loads in a multi-storied building. **[3]**

(ii) What are the sources of residual stress? With a neat sketch, show residual stresses in a hot rolled W-shaped section. **[2+3]**

(iii) What are the advantages and disadvantages of structural steel as a building material? [6]

(iv) 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+3]

QUESTION 3

Determine the number of ½-in dia. A325 bolts (F_y = 92 ksi, F_u = 120 ksi) in standard holes required to develop the full strength of A572 Grade 60 (F_u = 75 ksi) steel plates shown in **Figure 2**. Assume the portion of double lap splice is a bearing type connection with threads included in the shear planes, the arrangement of the bolts is not in a staggered pattern, a double row of bolts is used, and the center-to-center & edge distances of the bolts are 2.5d and 1.5d, respectively, where d is the diameter of the bolt. Show a neat sketch of the designed bolted connection. Ignore block shear mode and use **AISC-LRFD** approach. [20]
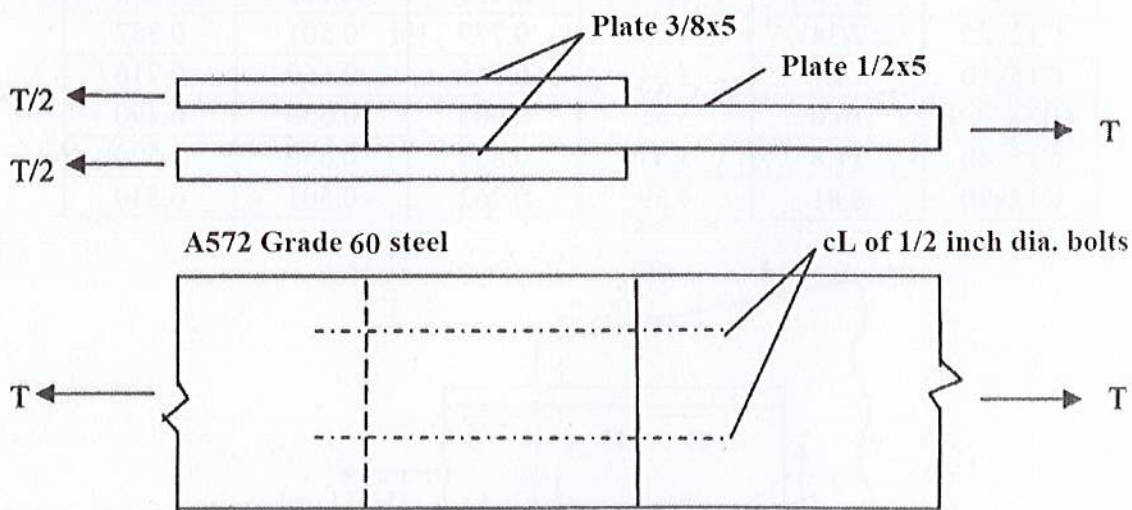

Figure 2

Formula

1. $R_n = mA_bF_{nv}$

2. $R_n = 0.6F_yA_{gv} + U_{bs}F_uA_{nt}$

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

4. $R_n = 1.2L_ctF_u \leq 2.4dtF_u$

Course Title: Environmental Engineering IV   Course Code: CE 433
Time: 1 hour   Credit Hour: 2.0   Full Marks: 60

(Answer all the questions. All questions are of equal value. Figures in the right margin indicate marks)

1. a) What are the types of air pollutants. Define those. [5]

   b) What is indicator organism? [5]

   c) Define BOD and COD. [5]

2. a) What are the sources and sinks of DO in surface water bodies? [6]

   b) Wastewater is being discharged at a point of a river. What will be the zones of pollution? Explain with figure. [6]

   c) Name the factors on which the treatment standards vary from country to country even national to provincial level. [3]

3. a) What are the different stages of life cycle of a lake? Explain. [5]

   b) A lake fed by a stream of wastewater. The details are given below: [10]

   Lake Area = 120×10^6 m^2, Lake flow rate = 25 m^3/s, Wastewater flow = 0.5 m^3/s, Phosphorus concentration in wastewater = 15 mg/L, Phosphorus concentration in lake = 0, and Settling velocity = 10 m/yr.

   Estimate average phosphorus concentration in the lake. Also Estimate removal rate at a treatment plant to keep the concentration below 0.015 mg/L.

4. Wastewater is discharged in a river at a certain point shown in the figure below. The details are given below. [15]

River	Wastewater
Q = 6.2 m^3/s	Q = 0.5 m^3/s
DO = 8.2 mg/L	DO = 3 mg/L
BOD$_5$ = 1.75 mg/L	BOD$_5$ = 170 mg/L
T = 20 °C	T = 35 °C

Both the reaeration rate and the deoxygenation rate are 0.50 d^{-1}. Find the DO sag curve equation in terms of time, critical time, critical deficit and minimum DO. The minimum level of Dissolved Oxygen (DO) necessary in the rivers and streams is 4 mg/L (ppm) for the survival of fishes and aquatic animals. Will the aquatic fish and animals survive beyond the critical point?

Equations:

$$t_c = \frac{1}{k_r - k_d} \ln\left[\frac{k_r}{k_d}\left(1 - D_a \frac{k_r - k_d}{k_d L_a}\right)\right]$$

$$D_c = \frac{k_d L_a}{k_r - k_d}\left(e^{-k_d t_c} - e^{-k_r t_c}\right) + D_a e^{-k_r t_c}$$

$$D_t = \frac{k_d L_o}{k_r - k_d}\left(e^{-k_d t} - e^{-k_r t}\right) + D_a\left(e^{-k_r t}\right)$$

$$DO_{sat} = 14.62 - 0.394T + 0.007714T^2 - 0.0000646T^3;$$

Course Title: Structural Engineering V (Prestressed Concrete)　　Credit Hour: 2　Course Code: CE 415
Time: 1 hour　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　Full Marks: 60

Answer all THREE questions. Assume value for any missing data

1. **Fig.1** shows the midspan section of a composite beam. The precast section 320mm by 900mm in depth is post-tensioned with an initial force of 2800 kN which reduces to 2500 kN after losses. The beam is simply supported on 24m span. The weight of the precast section in the form of distributed load over the beam is **3.75kN/m**. Moment at midspan due to the weight of the top slab 180x 1000mm to is 160kN-m after it is cast in place. After hardening of the floor slab, the composite section has to carry a maximum live load moment of 700 kN-m at midspan. Compute the stresses and hence draw the stress distribution diagram at midspan section for the following load conditions:

 i) Initial prestress force + weight of precast section
 ii) Effective prestress force + weight of precast section
 iii) Effective prestress force + weight of precast section + weight of the slab
 iv) Only live load
 v) All loading combined.　　　　　　　　　　　　　　　　　　　　　　　　**[4+2+4+8+4]**
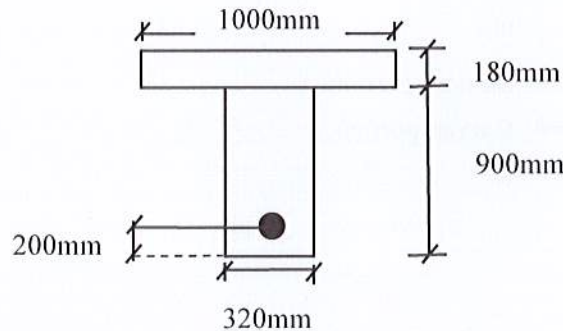

Fig.1

2. (a) Referring again to **Fig.1**, estimate the ultimate moment for the section provided.
Given, **Aps = 2400mm², f$_{pu}$ = 1650MPa, f$_c$' = 34MPa.**　　　　　　　　　　　　　**[10]**

　(b) A concrete beam 45ft long, with a uniform cross section of 18in by 18in, is prestressed concentrically by pretensioning 1.5in² of steel wires to a stress of 180,000psi. Compute the loss of prestress due to elastic shortening of concrete at the transfer of prestress using the gross area of concrete. Given, E$_{ci}$ = **5,000ksi and E$_s$ = 30,000ksi.**　　　　　　　　　　　　　　　　　　　　**[4]**

　(c) Between pretensioned and posttensioned members, which type do you think will undergo greater loss of prestress. Explain briefly.　　　　　　　　　　　　　　　　　　　　　　　**[4]**

3. (a) List the usual time-dependent losses of prestress. Name the factors influencing the shrinkage loss of prestressed concrete members. What type of tendon is there in practice to reduce the prestress loss due to relaxation?

(b) An overhanging beam as shown in **Fig. 2** is to be posttensioned from the end 'A' with a force 'P' kN. Compute the percentage loss of prestress due to friction from support 'A' to the free end. Solve using the exact friction formula. Given, co-efficient of friction (μ)= 0.40 and wobble effect (k) = 0.0033/m.   [6+14]
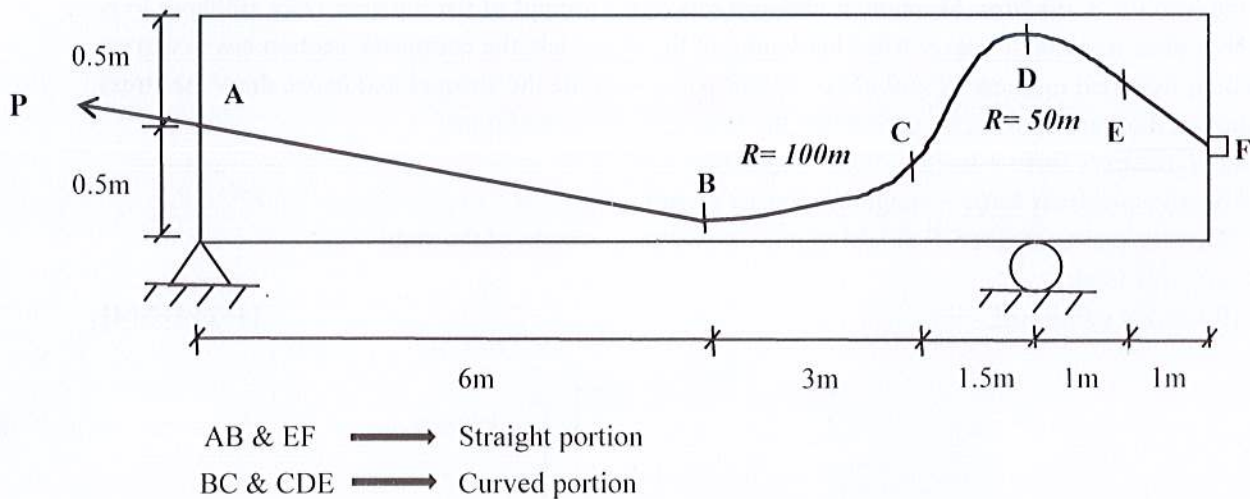

AB & EF ➝ Straight portion
BC & CDE ➝ Curved portion

Fig.2

Formulae

$f_{ps}=f_{pu} \{1 - 0.5\rho_p (f_{pu}/f_c')\}$

$\rho_p = A_{ps}/bd$

$F= -\mu\alpha$ (due to curvature effect)

$F = -KL$ (due to wobble effect)

$F_2=F_1e^{-\mu\alpha-kL}$

$\alpha = L/R$