University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination, Fall 2024
Program: B.Sc. in Civil Engineering

Course Title: Principles of Accounting | Course Code: ACN 301

Time: 1 hour | Credit Hour: 2 | Full Marks: 20

Submit your question inside your answer script

(4+4= 8)

1. a. "The information generated by accounting are used by various users"- explain.

   b. "Accounting is a systematic process to provide information to decision makers"- explain.

(7+2.5+2.5= 12)

2. Real Holdings, a real estate company, has the following transaction:

January 1	The owner invested cash in the business TK 5,000,000.
2	Paid one year rent for TK 100,000 in advance.
5	Real holdings received cash TK 300,000 for providing service.
10	Real holdings provided services for TK 700,000 on account.
15	The business purchased equipment TK 100,000.
25	Provided rent expenses for TK 100,000 on account.
31	Paid rent expenses TK. 50,000 (refer to January 25).

Required:

i. Prepare tabular analysis.
ii. Prepare income statement.
iii. Prepare balance sheet

University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Fall 2024
Program: B.Sc. in Civil Engineering
3rd Year 1st Semester

Course Title: Design of Concrete Structures I Course Code: CE 315 Credit: 3.0
Time: 1 hour Full Marks: 60

Answer all questions

Question 01: **[5*4=20]**

a. Explain with diagram how fundamental assumptions of reinforced concrete are applied to design of reinforced concrete beams.
b. Brielfy explain the reason why ACI recommends a maximum steel ratio (ρ_{max}) is less than the balanced steel ratio (ρ_b).
c. Distinguish between Dead loads and Live loads.
d. Explain the fundamental assumptions for reinforced concrete.

Question 02: **[20]**

Figure 1 shows a building plan with beam layout. Design the concrete cross section and the steel area equired for a simply supported rectangular beam (C2-D2) as shown in the Figure 1, that is to carry a computed dead load of 1.27 kips/ft and a service live load of 2.15 kips/ft. Material strengths are $f_c' = 4000$ psi and $f_y = 60{,}000$ psi.

Question 03: **[20]**

A simply supported beam (B1-C1, in Figure 1). has cross section as shown in Figure. 2. Analyze the section to determine the design moment capacity of the beam. For simplicity, assume $d = d_t$. Use $f'_c = 5000$ psi, and $f_y = 60000$ psi,

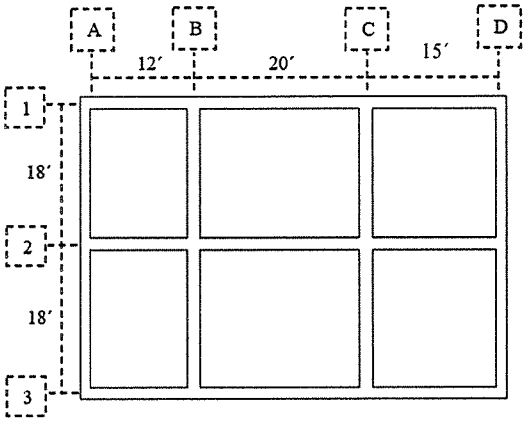

Figure 1: Beam layout

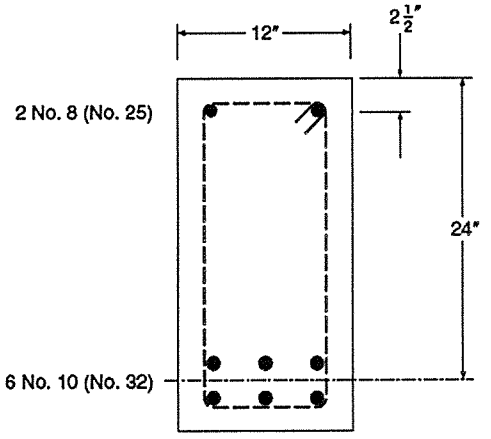

Figure 2: RC beam section

Formulae

$$\rho_{max} = 0.85\beta_1 \frac{f_c'}{f_y} \frac{\epsilon_u}{\epsilon_u + 0.004}$$

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

$$\overline{\rho}_{cy} = 0.85\beta_1 \frac{f_c'}{f_y} \frac{d'}{d} \frac{\epsilon_u}{\epsilon_u - \epsilon_y} + \rho'$$

$$\rho_{0.005} = 0.85\beta_1 \frac{f_c'}{f_y} \frac{\epsilon_u}{\epsilon_u + \epsilon_t}$$

$$\varphi = 0.65 + 83.3(\epsilon_t - 0.002)$$

$$c = \frac{\rho f_y d}{\alpha f_c'}$$

$$a = \frac{A_s f_y}{0.85 f_c' b}$$

$$a = \frac{(A_s - A_s')f_y}{0.85 f_c' b}$$

$$M_n = \rho f_y b d^2 \left(1 - 0.59 \frac{\rho f_y}{f_c'}\right)$$

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

$$A_s = \frac{M_u}{\phi f_y \left(d - \frac{a}{2}\right)}$$

$$M_n = M_{n1} + M_{n2} = A_s' f_y (d - d') + (A_s - A_s') f_y \left(d - \frac{a}{2}\right)$$

$$\rho_{\min} = \frac{3\sqrt{f_c'}}{f_y} \geq \frac{200}{f_y}$$

$$A_{s,min} = \frac{3\sqrt{f_c'}}{f_y} bd \geq \frac{200bd}{f_y}$$

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

for $\phi = 0.90$ is

$$\overline{\rho}_{0.005} = \rho_{0.005} + \rho'$$

TABLE A.1
Designations, diameters, areas, and weights of standard bars

Bar No.				
Inch-Pound[a]	SI[b]	Diameter, in.	Cross-Sectional Area, in^2	Nominal Weight, lb/ft
3	10	$\frac{3}{8}$ = 0.375	0.11	0.376
4	13	$\frac{4}{8}$ = 0.500	0.20	0.668
5	16	$\frac{5}{8}$ = 0.625	0.31	1.043
6	19	$\frac{6}{8}$ = 0.750	0.44	1.502
7	22	$\frac{7}{8}$ = 0.875	0.60	2.044
8	25	1 = 1.000	0.79	2.670
9	29	$1\frac{1}{8}$ = 1.128[c]	1.00	3.400
10	32	$1\frac{1}{4}$ = 1.270[c]	1.27	4.303
11	36	$1\frac{3}{8}$ = 1.410[c]	1.56	5.313
14	43	$1\frac{3}{4}$ = 1.693[c]	2.25	7.650
18	57	$2\frac{1}{4}$ = 2.257[c]	4.00	13.600

TABLE A.7
Maximum number of bars as a single layer in beam stems

$\frac{3}{4}$ in. Maximum Size Aggregate, No. 4 (No. 13) Stirrups[a]													
Bar No.		Beam Width b_w, in.											
Inch-Pound	SI	8	10	12	14	16	18	20	22	24	26	28	30
5	16	2	4	5	6	7	8	10	11	12	13	15	16
6	19	2	3	4	6	7	8	9	10	11	12	14	15
7	22	2	3	4	5	6	7	8	9	10	11	12	13
8	25	2	3	4	5	6	7	8	9	10	11	12	13
9	29	1	2	3	4	5	6	7	8	9	9	10	11
10	32	1	2	3	4	5	6	6	7	8	9	10	10
11	36	1	2	3	3	4	5	5	6	7	8	8	9
14	43	1	2	2	3	3	4	5	5	6	6	7	8
18	57	1	1	2	2	3	3	4	4	4	5	5	6

TABLE 4.1
Concrete stress block parameters

	f_c', psi				
	≤ 4000	5000	6000	7000	≥ 8000
α	0.72	0.68	0.64	0.60	0.56
β	0.425	0.400	0.375	0.350	0.325
$\beta_1 = 2\beta$	0.85	0.80	0.75	0.70	0.65
$\gamma = \alpha/\beta_1$	0.85	0.85	0.85	0.86	0.86

TABLE 4.2
Minimum beam depths for compression reinforcement to yield

	ϵ_t = 0.004		ϵ_t = 0.005	
f_y, psi	Minimum d'/d	Minimum d for d' = 2.5 in., in.	Maximum d'/d	Minimum d for d' = 2.5 in., in.
40,000	0.23	10.8	0.20	12.3
60,000	0.13	18.8	0.12	21.5
75,000	0.06	42.7	0.05	48.8
80,000	0.03	72.5	0.03	82.9

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination, Fall 2024
Program: B.Sc. in Civil Engineering
3rd Year 1st Semester

Course Title: Open Channel Flow | Course Code: CE 361
Time: 1 hour | Credit Hour: 3 | Full Marks: 40

Answer all the questions

QUESTION 1 [12 MARKS]

a. Summarize your understanding of occurrence of head losses; frictional loss (h_f) & eddy loss (h_e) in open channel flow. [7]

b. Why velocity distribution coefficients are used in open channel flow? Discuss. [5]

QUESTION 2 [8 MARKS]

Prove that at the critical state of flow, the specific energy is minimum for a given discharge and the discharge is maximum for a given specific energy. [8]

QUESTION 3 [10 MARKS]

For a trapezoidal channel with b = 6.5 m and s = 2, compute the critical depth using Newton-Raphson method, if flow rate, Q = 15 m^3/s and $\alpha = 1.10$. Use the starting value of h as 1.5 m. [10]

QUESTION 4 [10 MARKS]

The data collected during the stream-gauging operation at a certain river section are given below. Compute the discharge and the mean velocity for the entire section. [10]

Distance from left bank (m)	Total depth (m)	Meter depth (m)	Velocity (m/s)
0	0		
2	1	0.6	0.4
5	3.5	2.8 0.7	0.8 1.5
7	3.8	3.04 0.76	1.4 1.7
9.5	2.2	1.76 0.44	0.6 0.8
12	0.8	0.48	0.68
14	0		

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination (Fall 2024)
Program: B. Sc. Engineering (Civil)

Course Title: Environmental Engineering I (Water Supply Engineering) Course Code: CE 331
Time: 1 hour Credit Hours: 3.00 Full Marks: 60

There are **TWO** questions in **Part – A** and **Part - B**. Answer all the questions in separate answer scripts. *(30*2 = 60)* [Assume reasonable data if any]

Part - A

1. **a)** You need to design a sedimentation tank. Discuss the details of the tank with a schematic showing the different zones of the tank. Explain "surface overflow rate" with definition and with reference to comparing with "settling velocity". **[10]**

b) A water treatment plant is being designed to process 50,000 m^3/d of water. Jar testing and pilot-plant analysis indicate that an alum dosage of 50 mg/L with flocculation at a Gt value of $4x10^4$ produces optimal results. Calculate: **[12]**

- **i)** The monthly alum requirement
- **ii)** The flocculation basin dimensions
- **iii)** The power requirement

Assume that the absolute viscosity of the water is $8.91x10^{-4}$ Pascals.second.
[$t_d = V/Q$, $G = \sqrt{(P/\mu V)}$]

c) Explain the principle of coagulation process and any one mechanism of electrical double layer compression. **[8]**

Part - B

2. **a)** A raw water is tested in the laboratory to determine the water quality parameters. The pH and temperature of the water sample were found to be 7.8 and 27°C respectively. In addition, the total alkalinity, hardness (calcium ion concentration) and total dissolved solids were calculated as 95 mg/L as $CaCO_3$, 31 mg/L as Ca^{2+}, and 240 mg/L respectively. Calculate and comment on the stability of water using **Ryznar Index.** **[10]**

b) A 3 ft diameter pipe is buried on a trench in a highway. The top of the pipe is 4.5 ft below the surface of the fill. A superimposed uniform load of 85 lb/ft^2 is acting on the ground. The dimension of the area of the uniform load along the length of the pipe is 18 ft. Calculate the total load on the pipe. **[8]**

c) An intake station has been designed for a locality to collect surface water from the adjacent river. The entrance of the intake lies 5 ft below the water surface and 12 ft above the river bed. The velocity of the intake pipe is measured as 5 fps. Comment on whether the intake station is appropriate given the ideal design specifications. Explain your points using the appropriate design specifications. **[8]**

d) Explain the concepts of "Grey water" and "Black Water". **[4]**

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination, Fall 2024
Program: B.Sc. in Civil Engineering
3rd Year 1stSemester

Course Title: **Business Management** Course Code: IMG 303
Time: 01 hour Credit Hour: 3.00 Full Marks: 20

Answer any two from the below three Questions

QUESTION 1 [5+ 5]

a) Describe the types of skills are necessary for a Manager to be successful in an organization .
b) Explain the various managerial roles a Manager may need to perform in an organization .

QUESTION 2 [5+5]

a) Draw the Management process diagram and briefly explain each of the process
b) Define any management theory and its application in Civil engineering projects

QUESTION 3 [5+5]

a) Discuss the factors that determine the long –term attractiveness of a business as suggested by Michel Porter
b) Briefly discuss the different strategies that a company can use to adopt to their dynamic environment

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall-2024
Program: B.Sc. Engineering (Civil)

Course Title: **Geotechnical Engineering I** Course Code: **CE 341**
Time: 1 hour Credit Hour: 3.0 Full Marks: 50

[Answer all the questions. Digits in the right margin inside the 1st parentheses indicate marks]

PART-A

1. (a) Define the following soil deposits:

(i) Verved clay (ii) Dunes (iii) Colluvial soil or Talus **(3)**

(b) Classify different types of soils based on particle size according to Unified Soil Classification System (USCS). **(3)**

(c) Liquid limit test was carried out on a silty clay sample using Casagrande's apparatus and the following results were obtained:

No. of blows (N)	15	19	24	30	35
Water Content (%)	48.4	46.5	44.9	43.6	42.6

Plot the flow curve in a semi-log graph paper and determine the liquid limit of the sample. Also compute the flow index of the sample. **(6)**

2. (a) With neat sketches define various types of primary structure of coarse grained soil. **(4)**

(b) The values of liquid limit and flow index of a silty clay sample, as estimated from the flow curve, have been found to be 57% and 17%, respectively. The natural water content and plastic limit of the sample were found to be 34% and 23%, respectively. From grain size analysis, clay fraction (smaller than 0.002 mm) of the sample was found to be 48%. Calculate liquidity index, consistency index, toughness index and activity of the sample. **(4)**

(c) Define Shrinkage limit.

A saturated clay sample has a volume of 16.3 cm^3 and a weight of 28.7 gm. On drying, the sample attains a volume of 9.9 cm^3 and a weight of 19.8 gm. Determine the shrinkage limit, Shrinkage ratio and specific gravity of solids (G_s) of the sample. Assume unit weight of water to be 0.99627 gm/ cm^3.

(5)

PART-B

3. a) Draw phase diagrams for moist, dry and saturated soil. **(3)**
b) In a construction project, the unit weight of a moist soil (Gs=2.66, moisture content=15%) is found as 18.81 kN/m^3. If maximum and minimum dry unit weight determined in the laboratory were 17.83 kN/m^3 and 13.97 kN/m^3, respectively. Find the following properties of soil__ **(7)**

I. Void ratio
II. Air content
III. Dry unit weight
IV. Density index

4. a) Show (by drawing two qualitative curves) the effect of compactive energy on compaction curve. **(3)**

b) For a given soil, the attached table shows the results of compaction tests conducted in the laboratory. **(12)**

Moisture content (%)	Dry density (kg/m^3)
9.5	1550
11.5	1590
13.5	1595
15.5	1575
17.5	1535

The following are the results of a field density test performed on the same soil using sand cone method.

Mass of Ottawa sand to fill the test jar = 6.08 kg
Volume of jar = 0.0038 m^3

Mass of jar + cone + sand (before filling the hole) = 7.49 kg
Mass of jar + cone+ sand (after filling the hole) = 4.38 kg
Mass of Ottawa sand to fill the cone = 0.439 kg

Mass of compacted soil collected from hole = 3.16 kg
Moisture content of wet soil collected from hole = 22.58 %

(i) Determine the maximum dry density in laboratory and optimum moisture content using plain graph paper.

(ii) If the specification of this highway project demands 100%±2% relative compaction to be achieved, then check whether the field compaction meets the demand or not.

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination, Fall 2024
Program: B.Sc. in Civil Engineering
3rd Year 1st Semester

Course Title: Structural Engineering I | Course Code: CE 311
Time: 1 hour | Credit Hour: 3.00 | Full Marks: 40

Answer all the questions
Assume any missing data reasonably

PART-A

QUESTION 1 [15 MARKS]

Analyze the cable supported bridge to determine the maximum and minimum tension of the cable and the force in each of the hangers. The girder is subjected to the two concentrated loads shown in **Figure 1** and joint B is pin connected. Draw the shear and moment diagrams for the pin connected girders **AB** and **BC**. The cable has a parabolic shape. [15]

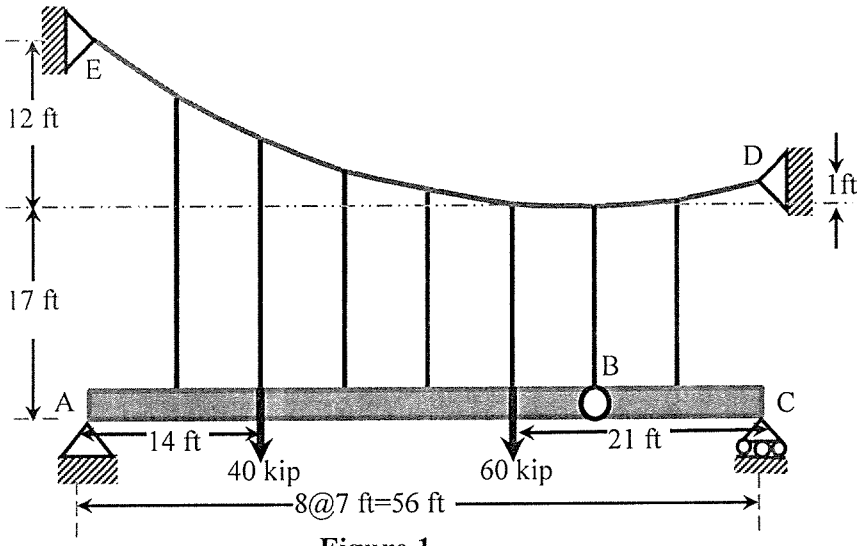

Figure 1

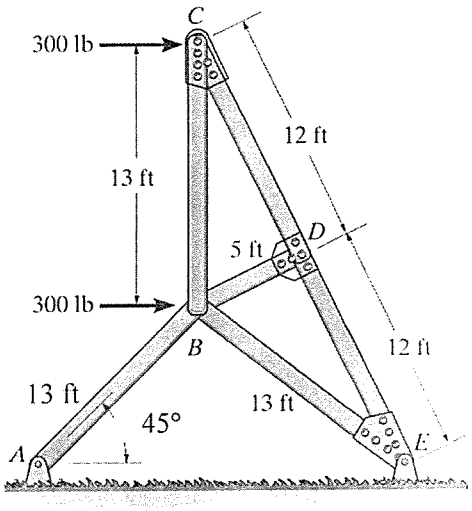

Figure 2

QUESTION 2[10 MARKS]

A billboard is subjected to a wind load that exerts horizontal forces of **600 lb** on joint **B** and **500 lb** on joint C of the truss shown in **Figure 2**. Analyze the truss and determine the support reactions and force in each member of the truss and state if the members are in tension or compression. [07]

PART-B

QUESTION 3 [6 MARKS]

Draw the influence lines for R_A, V_{CL} and M_C of the beam shown in **Figure 3**. [6]

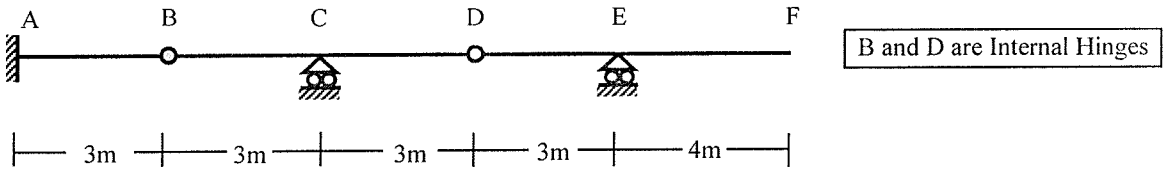

Figure 3

QUESTION 4 [6 MARKS]

Draw the influence lines for R_A, V_B and M_C of the plate girder ABCD shown in **Figure 4**, if unit load passes over the stringer ace. [6]

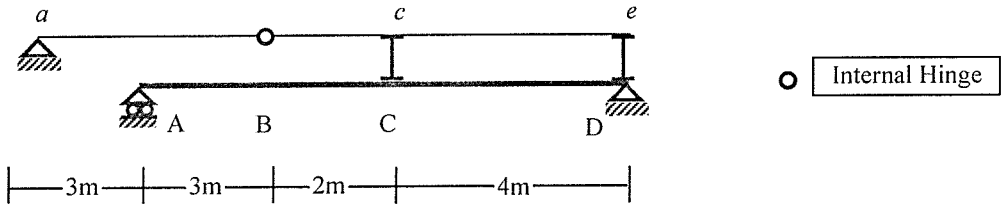

Figure 4

QUESTION 5 [6 MARKS]

Draw the influence lines for X_a, V_c, and $M_{d\,(de)}$ of the frame shown in **Figure 5**, if the unit load moves over beam ***af***. [6]

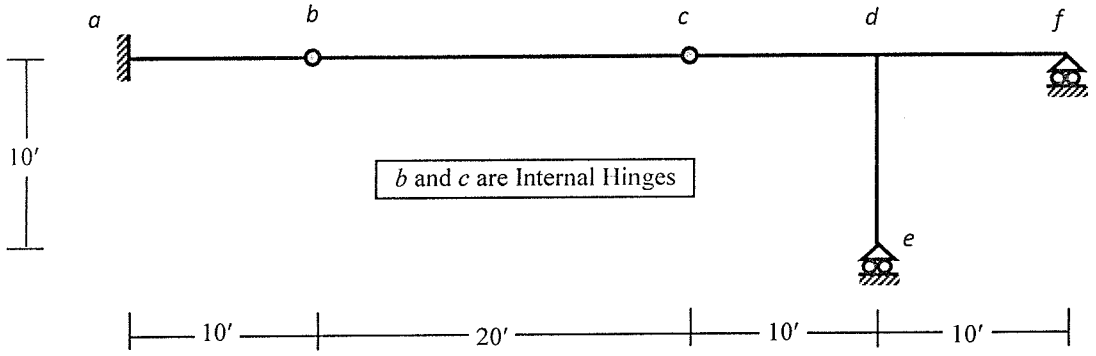

Figure 5