University of Asia Pacific
Department of Civil Engineering
Midterm Examination, Spring 2022
Program: B.Sc. Engineering (Civil)

Course Title: Principles of Accounting | Course Code: ACN 301
Time: 1 hour | Credit Hour: 2 | Full Marks: 20

(Answer ALL the Questions.)

1. Mention the purposes of accounting. Describe the need of accounting for engineering. **(1+2 = 3)**

2. Abed Hossain started his own delivery service, Abed Deliveries, on June 1, 2016.

June 1	Abed invested Tk. 20,000 cash in the business.
2	Purchased equipment for Tk. 10,000 cash and a note payable of Tk. 4,000.
3	Received legal services of Tk. 1,600 for the business on account.
5	Performed services worth Tk. 16,000: Tk. 10,000 cash is received from customers and the balance of Tk. 6,000 is billed to customers.
9	Withdrew Tk. 400 cash for personal use.
12	Purchased supplies for Tk. 300 on account.
15	Borrowed Tk. 6,000 from the bank on a note payable.
20	Received a cash payment of Tk. 2,500 for services provided on June 5.
23	Made cash payment of Tk. 1,200 on the note payable.
26	Paid part-time employee salaries Tk. 500.

Requirement: Apply the extended version of accounting equation and show the effects of the above transactions on the accounting equation using the following format. (7)

	Assets				= Liabilities		+ Owner's Equity			
Date	Cash	+ Accounts Receivable	+ Supplies	+ Equipment	= Notes Payable	+ Accounts Payable	+ Owner's Capital	− Owner's Drawings	+ Revenues	− Expenses

3. Ecstasy Park was started on April 1 by Dilwar Hossain. The following selected events occurred during April.

Apr. 1 Dilwar invested Tk. 70,000 cash in the business.

8 Billed Daily Star for advertising expense of Tk. 3,600.

12 Hired a park manager at a salary of Tk. 8,000 per month, effective May 1.

13 Paid Tk. 2,650 cash for a one-year insurance policy.

20 Received cash of Tk. 13,600 for services provided.

25 Sold 400 ticket books for Tk. 5 each. Each book contains 5 coupons that enable the holder to use any one of the entertainment services provided by Ecstasy Park.

30 Paid Tk. 1,800 for the balance due on April 8.

Requirements:

(a) Journalize the transactions. **(4)**

(b) Post to the ledger accounts. **(6)**

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination , Spring 2022
Program: B. Sc. Engineering(Civil)

Course: Structural Engineering I
Time: 1.00 Hour

Course Code: CE311
Full Marks: 40

Answer all the Questions
Assume any missing data reasonably.

1. **For the beam shown in Fig. 1, draw the Influence line for the Bending Momemt at R and Q ,and for Shear force at R and Q . Also calculate the maximum value of the Bending moment at R and Q for a moving live point load of P kip .....[14]**

   where P= last digit of your student No +10

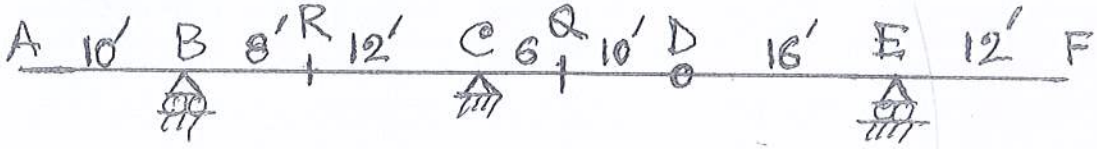


FIG 1

2. **Draw the bending moment diagram for the frame shown in Fig. 2,**

   where P = last digit of your student No +10 ..... [12]

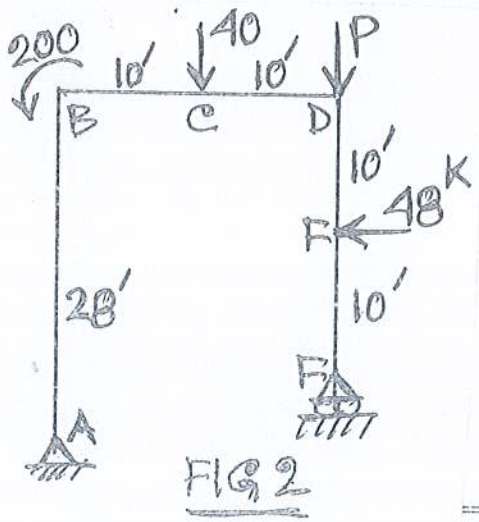


FIG 2

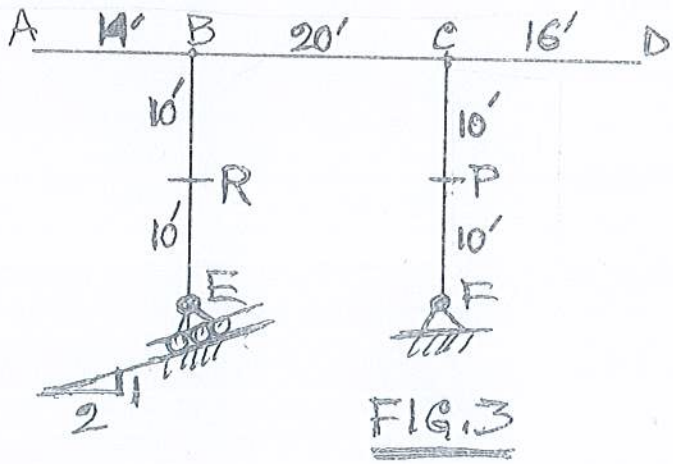


FIG 3

3. **Draw the influence lines for the reactions and for the shear force & bending moment at P of the frame shown in Fig. 3, ... [14]**

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2022
Program: B. Sc. Engineering (Civil)

Course #: CE 315 — Course Title: Design of Concrete Structures I
Full Marks: 40 (= 4 × 10) — Time: 1 hour

[Given: $f_c' = (4 + 0.01R_0)$ ksi, $f_y = 15f_c'$, R_0 = Last two digits of Registration #]

1. (i) Which topic do you think is the most important among the ones taught in this course so far? Explain why you think so.
   (ii) Explain the difference between flexural stress distribution over T- and rectangular beam sections and narrate the effect on the design of T-beams.

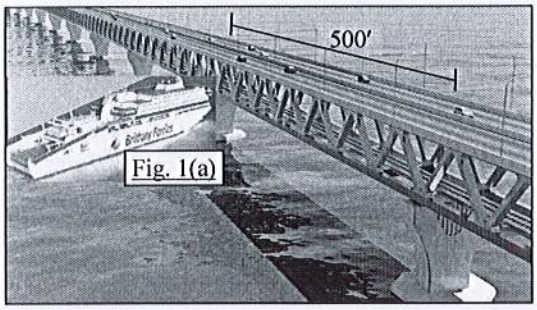


Fig. 1(a)

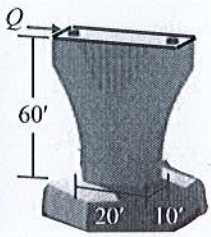


Fig. 1(b)

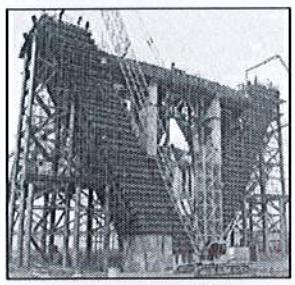


Fig. 1(c)

2. Fig. 1(a) shows a ferry colliding with a RC bridge-pier supporting 500-ft span of bridge deck. Fig. 1(b) shows details of the pier; i.e. its height = 60 ft, critical cross-section and the lateral force Q acting on it. Fig. 1(c) shows detailed reinforcements on the pier, with maximum steel area A_{smax} (corresponding to steel ratio of ρ_{max}) on both sides of the section. Calculate the
   (i) Ultimate compressive force capacity of the pier section and corresponding ultimate (distributed) load on the deck.
   (ii) Cracking moment of the section and corresponding force Q that would cause the section to crack.

3. Fig. 2 shows a helicopter colliding with a cylindrical overhead water tank; i.e. applying a horizontal force $F = (500 + R_0)$ kips on it. The water tank is supported on a square-shaped ($b \times h$, with $b = h$) RC column of length $L = (20 + 0.1R_0)$ ft.
   For the applied horizontal force, design the RC column by WSD method using $f_{call} = 0.45f_c'$ and $f_{sall} = 0.4f_y$,.
   (i) Obtain dimensions (b, h) and reinforcements of a singly reinforced beam
   (ii) Use reduced dimensions ($0.9b$, $0.9h$) to calculate reinforcements of a doubly reinforced beam
   (iii) Sketch the section for doubly reinforced beam, considering the helicopter could collide from any direction.

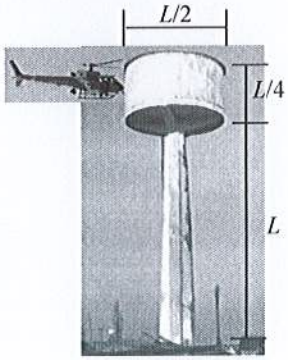


Fig. 2

4. Answer Question 3 using the USD method, assuming force $F = (500 + R_0)$ kips as live load, calculating
   (i) Dimensions (b_o, h_o) and reinforcements for steel ratio ρ_{max} for singly reinforced beam
   (ii) Dimensions ($0.9b_o$, $0.9h_o$) and reinforcements of a doubly reinforced beam.
   (iii) Sketch the section for doubly reinforced beam, if the helicopter could collide from any direction.

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Spring 2022
Program: B. Sc. Engineering (Civil)

Course Title: Environment Engineering I — Course Code: CE 331
Time- 1 hour — Full marks: 60

There are **Two** questions. Answer all the questions. *(30*2 = 60)*
[Assume reasonable data if any]

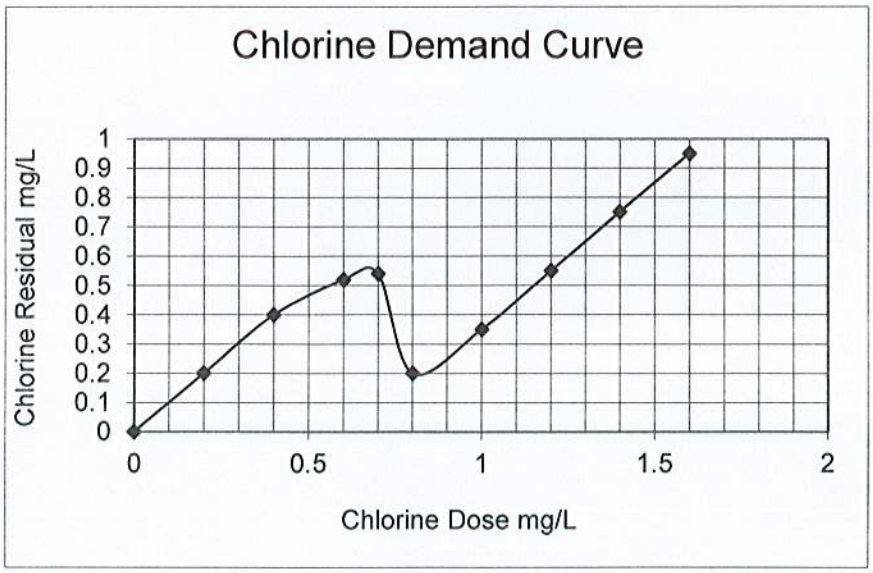
1. (a) You assessed a groundwater as too hard for distribution purpose. How can you employ the softening for hardness removal if the water has $Ca(HCO_3)_2$, $Mg(HCO_3)_2$ vs if the water has $MgSO_4$. Provide the names of the chemicals to be added and the reactions. (12)

OR

If a river has huge concentration of suspended solids, which treatment method/units would you employ? Explain the treatment units including the factors affecting the process.

(b) A city has to treat 15,000 m^3/d of water. For satisfactory removal, an overflow rate of 20 m/d is required at a depth of 3.5 m. Calculate the required surface area (m^2), volume (m^3) and detention time (h) for the settling tank. Also determine the diameter required for a circular settling basin using the obtained information. (10)

(c) Please answer the following questions utilizing the Chlorine Demand Curve: (8)



i) What is the chlorine dose in mg/L for achieving Breakpoint Chlorination?
ii) What is the chlorine dose in mg/L to achieve a free residual of 0.65 mg/L?

iii) What is the required chlorine dose in lbs/day for the plant to maintain a total residual of 0.6 mg/L (Q = 1 MGD)?

2. (a) Provide your brief understanding on "intakes" and elaborate on "river intakes". (8)

(b) The table below shows the properties of four types of soil. Mention which type of soil is capable of retaining most of the water and which one is capable of discharging most of the water. Also, calculate the maximum amounts retained and discharged respectively if the aquifer bearing the soil layer has a total volume of 1000 m^3. (6)

Soil type	Porosity (%)	Specific yield (%)
Clay	45	3
Sand	35	25

(c) Enumerate the desirable qualities of pressure pipes and provide examples on which pipe materials would be able to impart each of the qualities for the pipes (for each desirable quality that you specify, mention the pipe materials too that match with the property). (10)

(d) Provide a comparative differentiation between the surface water and ground water quality. (6)

Given Formula:

I. $t_d = V/Q$

II. 1 Gallon = 3.78 L

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Spring-2022
Program: B.Sc. Engineering (Civil)

Course Title: **Geotechnical Engineering I (Soil Mechanics)** Course Code: **CE 341**

Credit Hour: 3.0

Time: 1 hour Full Marks: 60

Q.1 During construction of a highway, Modified Proctor test is conducted in the laboratory on a silty sand sample and the test results are given in the following Table. (8+12)

Moisture content (%)	Dry unit weight (kN/m³)
7	16.83
9	19.65
10	20.52
12	20.61
13	19.47
15	17.76

The following are the results of a field density test performed on the same soil following sand cone method.
Calibrated dry density of Ottawa sand = 1613 kg/m³
Calibrated mass of Ottawa sand to fill the cone = 0.632 kg
Weight of jar + cone + sand (before use) = 8.39 kg
Weight of jar + cone+ sand (after use) = 5.02 kg
Weight of wet soil from hole = 4.27 kg
Moisture content of wet soil = 17.29 %

a) Determine_ Maximum dry unit weight in laboratory and optimum moisture content.

b) If the specification of this highway project demands 95% relative compaction as minimum which must be achieved, then check whether the field compaction meets the demand or not.

Q.2 Write short notes on ___ (3*4=12)

a. Alluvial soil deposit
b. Erratics
c. Shrinkage limit

Q.3 From SPT test, undisturbed soil sample was collected from the field in steel Shelby tubes for laboratory evaluation. The tube sample has a diameter of 71 mm, length of 558 mm, and a moist weight of 42.5×10^{-3} kN. If the oven-dried weight was 37.85×10^{-3} kN, and Gs 2.69, Calculate the following___ (8)

a. Dry unit weight
b. Field moisture content
c. Porosity
d. Degree of saturation

Q.4 During hydrometer analysis of a silty clay sample using **152H hydrometer** the reading of the hydrometer observed at elapsed time of 4 minutes is 47. The suspension was prepared using 50gm dry soil sample in 1000cc water. The temperature of lab room at that time was 19°C. If the viscosity and density of water at 19°C is 7.98millipoise and 0.99598gm/cm³ respectively, then find the value of particle size(diameter) and percent finer (%) at that specific time. [Given that, Gs=2.72; Temperature correction=0.97; Zero or deflocculating agent correction=2.8; Meniscus correction= 0.7] (8)

[For 152H hydrometer,

$$D=\sqrt{\frac{18\mu}{(G_s-1)\gamma_\omega}\frac{z_r}{t}}\ ;\ N=\frac{aR_c}{W_s}x100\%\ ;\ a=\frac{1.65G_s}{2.65(G_s-1)}\ ;\ Z_r \text{ or } L(cm)= 16.3-0.1641R]$$

Q.5 A silty clay sample of soil was tested for Liquid limit using Casagrande's apparatus and the following results were obtained: (12)

No. of blows	Weight of can (gm)	Weight of wet soil+can (gm)	Weight of dry soil+can (gm)
15	7.77	40.69	29.81
19	10.46	37.37	28.75
23	7.02	36.33	27.15
30	10.94	38.81	30.35
34	6.38	32.66	24.76

Estimate the value of Liquid limit.

The natural water content and plastic limit of the sample were found to be 36% and 27% respectively. From grain size analysis, clay fraction (smaller than 0.002 mm) of the sample was found to be 29%. Calculate the values of toughness index, liquidity index, consistency index and activity of the sample.

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Spring – 2022
Program: B.Sc. Engineering (Civil)

Course Title: Open Channel Flow | Course Code: CE 361
Time: 1 hour | Credit Hour: 03 | Full Marks: 60

There are Two Questions. Answer All the Questions *(30*2 = 60)*

[Assume reasonable data if any]

1. a) Explain why Froude number is more important than the Reynolds number to determine the state of open channel flow. **[5]**

b) A circular channel 3.5 m in diameter carries a discharge of 7.5 m^3/s at a depth of 2.1 m. Estimate the state of flow. If elementary waves are created in this channel, compute the speed of the wave fronts upstream and downstream. **[10]**

c) Using the trapezoidal rule of numerical integration, compute the **i)** discharge per unit width **ii)** the mean velocity and **iii)** the numerical values of α and β for the following velocity measurements (u is the velocity at a distance z from the channel bottom) along a vertical in a wide channel, when the total depth is 0.90 m.

z(m)	0	0.05	0.15	0.30	0.45	0.60	0.75	0.90
u(m/s)	0	2.00	1.85	1.73	1.36	1.08	0.60	0

[15]

2. a) At the critical state of flow, show that the specific energy is minimum at a given discharge but discharge is maximum at a given specific energy. **[8]**

b) A civil engineer of a reputed firm of our country has been given assigned the responsibility to collect data from Jamuna river at the Bhuapur station in Tangail. He has collected the following data on the 2nd July, 2022: A = 33,500 m^2, Q = 56,200 m^3/s and B = 3820 m. Assuming that the flow is uniform, now you have to (i) compute n, C, f, u^* and τ_0, and (ii) determine whether the channel boundary is smooth or rough taking the velocity distribution as logarithmic. Assume that the river is wide. Longitudinal slope of the river is 4 cm/km. **[12]**

c) A bridge is to be constructed across river Kushiara at a section 10 km wide (consider rectangular section) carrying a discharge of 1,00,000 m^3/s at a depth of 10 m. If it is intended to provide the minimum length (consider critical condition) of the bridge by reducing the river width, determine the minimum river width without affecting the upstream flow? Neglect energy losses and assume $\alpha = 1$. **[10]**

Given Formula:

Triangular channel	Trapezoidal channel	Circular Channel
$A = (sh)h$	$A = (b + sh)h$	$h = \frac{d_o}{2}\left[1 - cos\frac{\omega}{2}\right]$
$P = 2h\sqrt{1 + s^2}$	$P = b + 2h\sqrt{1 + s^2}$	$\omega = 2cos^{-1}\left(1 - \frac{2h}{d_o}\right)$
$B = 2sh$	$B = b + 2sh$	$A = (\omega - sin\omega)\frac{d_o^2}{8}$
Rectangular Channel		$B = d_o \sin\frac{\omega}{2}$
A = bh		$P = \frac{\omega d_o}{2}$
P= b + 2h		*Note that ω is in radian*

$E = h + \alpha U^2/2g$

$Z_c = \frac{Q}{\sqrt{g/\propto}}$; $Z = A\sqrt{D}$; $h_c = \sqrt[3]{\frac{\alpha Q^2}{gb^2}}$ $h_c = \sqrt[3]{\frac{q^2}{g}}$ $h_n = \sqrt[3]{\frac{q^2}{S_0 C^2}}$

$Fr = U/\sqrt{gD}$; $Re = UR/\nu$ $\alpha = \frac{\sum u^3 \Delta A}{U^3 A}$ $\beta = \frac{\sum u^2 \Delta A}{U^2 A}$

Continuity Equation

$Q = A_1U_1 = A_2U_2 = \ldots\ldots$

Energy Equation: $z_1 + h_1 + \alpha_1 \frac{U_1^2}{2g} = z_1 + h_1 + \alpha_2 \frac{U_2^2}{2g} + h_f$

Momentum Equation: $\rho Q(\beta_2 U_2 - \beta_1 U_1) = Fp_1 - Fp_2 + W \sin\theta - F_f$

Uniform flow formulae:

$U = CR^{1/2}Sf^{1/2}$; $U = \sqrt{(8g/f)}\, R^{1/2}Sf^{1/2}$; $U = (1/n)\, R^{2/3}S_f^{1/2}$ $Z = AR^{2/3}$; $Z = AR^{1/2}$

$Q = (1/n)\, AR^{2/3}S_f^{1/2}$ $Q = CAR^{1/2}S_f^{1/2}$ $K = (1/n)\, AR^{2/3}$ $K = CAR^{1/2}$

$\tau_0 = \gamma h S_0$ $u^* = \sqrt{gRS_0}$ $\frac{U}{u^*} = 5.75\ \log\left(\frac{3.64\, u^* R}{\nu}\right)$

$$\frac{U}{u^*} = 5.75\ \log\left(\frac{12.2\, R}{k_s}\right)$$

$$\frac{U}{u^*} = 5.75\ \log\left(\frac{12.2\, R}{k_s + 3.35\nu/u^*}\right)$$