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

Course: Structural Engineering I | **Course Code: CE311**
Time: 1.00 Hour | **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 (i) Bending Momemt at B and D , and (ii) Shear force at B and D . Calculate the maximum value of the Bending moment at B and D for a moving point live load of 30 kip .....[14]**

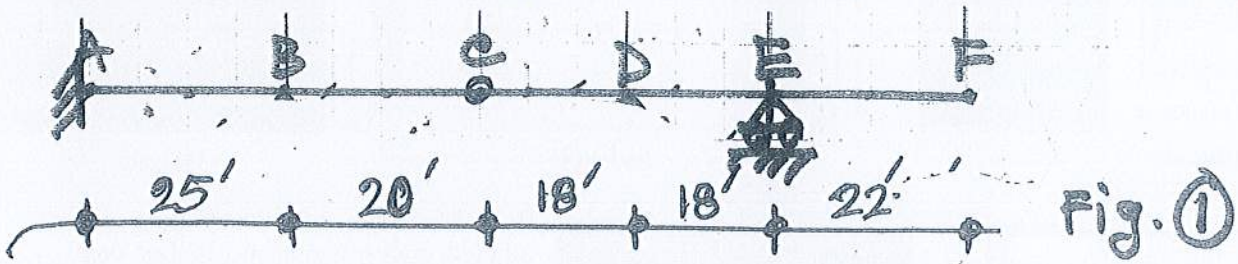


Fig. (1)

2. **Draw the bending moment diagram for the frame shown in Fig. 2. Show in a clear Sketch all the reactions with value and direction. ..... [12]**

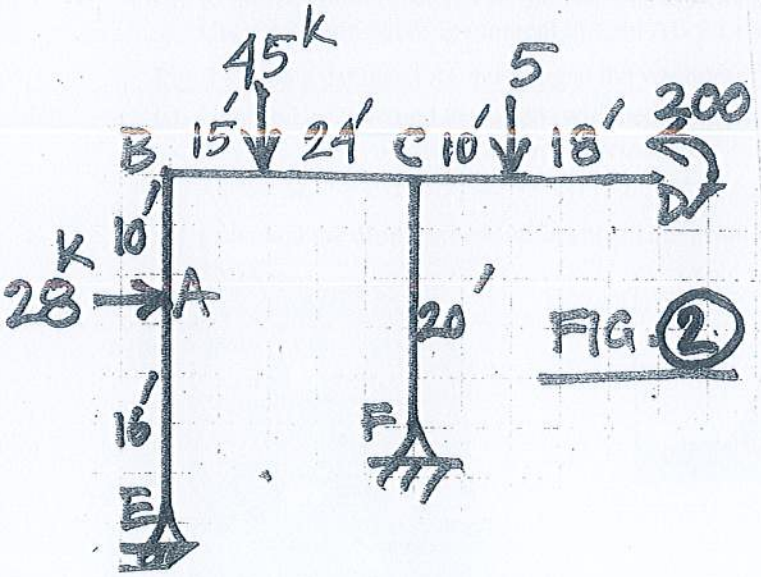


FIG. (2)

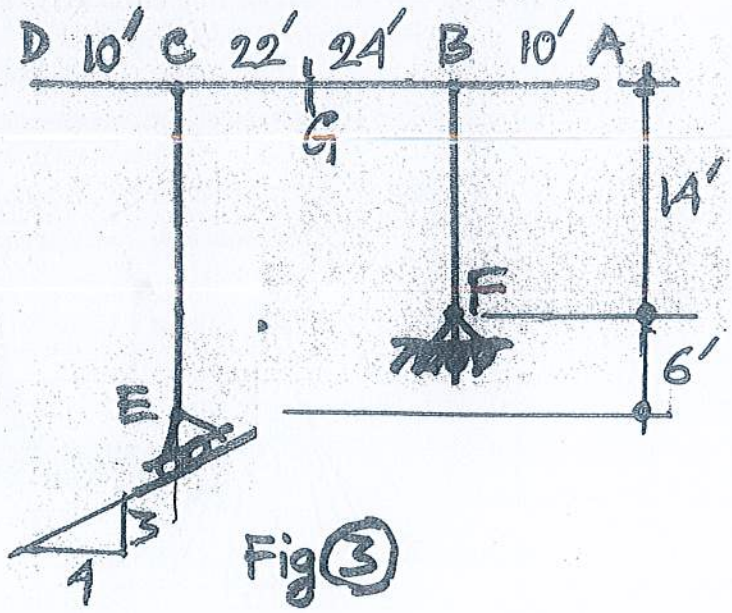


Fig (3)

3. **Draw the influence line for (i) the shear force at G and (ii) the reaction of the Roller support of the frame shown in Fig. 3, ... [14]**

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2021

Course #: CE 315 — Course Title: Design of Concrete Structures I

Full Marks: 40 (= 4 × 10) — Time: 1 hour

[Given: $f_c' = (20 + 0.1R)$ MPa, $f_y = 15f_c'$, $f_{call} = 0.45f_c'$, $f_{sall} = 0.4f_y$, R = Last two digits of Registration #]

1. (i) Show the variations of stress and strain over an RC section as it is stressed gradually from uncracked to cracked and ultimate failure condition.

   (ii) Fig. 1(a) shows the test-run of *Dhaka Metro Rail* while Fig. 1(b) shows its typical span AB (30^m long) supported on piers AC and BD. Fig. 1(c) shows pier reinforcements during construction, and Fig. 1(d) shows the ($2^m \times 2^m$) pier cross-section with reinforcements.

   * Calculate the ultimate (nominal) compression force capacity of the pier section shown in Fig. 1(d).
   * Also calculate stresses in concrete and steel if AC is subjected to the load from rail-deck (weighing 200 kN/m) and train (weighing 50 kN/m).

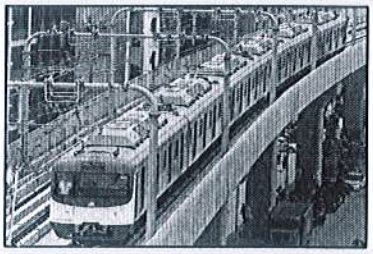


Fig. 1(a)

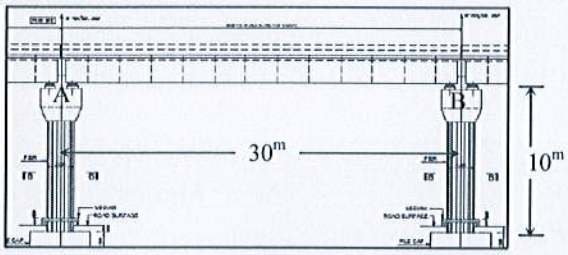


Fig. 1(b)

Fig. 1(c)

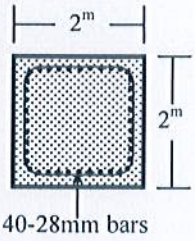


Fig. 1(d)

2. Fig. 2(a) shows the cross-section of slab-deck of *Dhaka Metro Rail*, and Fig. 2(b) shows its simplified form.

   Use Fig. 2(b) to calculate the

   (i) Cracking moment of the cross-section (assumed 'unreinforced')

Fig. 2(a)

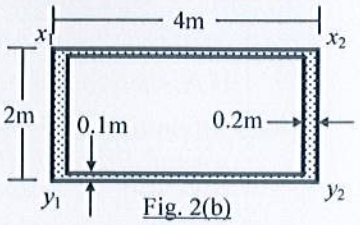


Fig. 2(b)

   (ii) Required reinforcements in the section, assuming it is composed of two L-Beams (x_1y_1 and x_2y_2). Use maximum bending moment in span AB for the deck and rail load described in Question 1.

3. Fig. 3 shows a damaged RC building at the war-torn Ukraine.

   (i) Use the USD method to design (with neat sketches of cross-sections) the rectangular beam ***abcde*** [of length $L = (4 + 0.01R)^m$ and cross-section ($0.3^m \times 0.4^m$)] for moments $M_b^{(+)} = M_d^{(+)} = 0.07wL^2$, $M_c^{(-)} = 0.11wL^2$, if it is subjected to factored load $w = (30 + 0.1R)$ kN/m.

   (ii) Calculate the ultimate vertical load (w_u) the beam can carry for a steel ratio $\rho_s = \rho_{max}$.

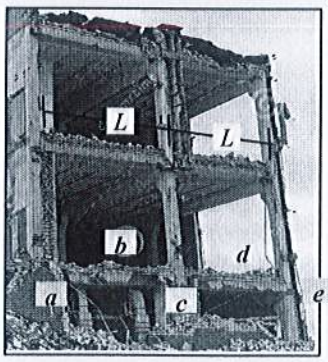


Fig. 3

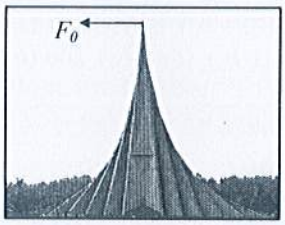


Fig. 4(a)

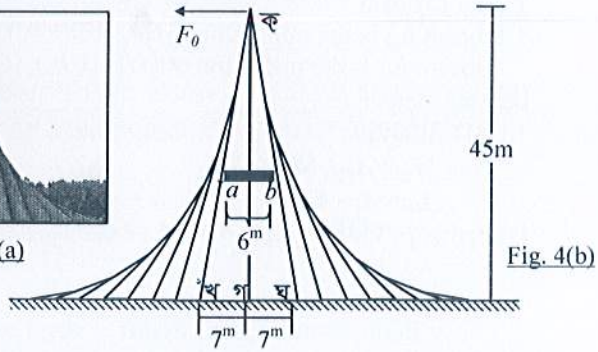


Fig. 4(b)

4. Fig. 4(a) shows *Jatiyo Smriti Shaudha* at Savar while Fig. 4(b) shows a simplified form of the structure.

   (i) Use WSD method to calculate the working vertical load (w) the simply-supported beam *ab* (of length 6^m, rectangular cross-section ($0.3^m \times 0.6^m$) and steel ratio $\rho_s = 1.5\%$) can carry.

   (ii) Design the beam (ক খ গ) (of width $b = 0.2^m$ and depth $h = 7^m$) by WSD if subjected to concentrated horizontal force $F_0 = (1500 + 10R)$ kN at the tip point ক.

List of Useful Formulae for CE 315

Fundamentals

* Tensile strength of concrete $f_t' = 0.5\sqrt{f_c'}$ MPa $E_c = 5000\sqrt{f_c'}$ MPa $E_s = 200$ GPa
  Modular ratio, $n = E_s/E_c$
* Within elastic limit, Flexural stress $f_c = M\,\bar{y}/\bar{I}$
* Steel Ratio $\rho_s = A_s/bd$ Minimum Steel Ratio $\rho_{min} = 0.25\sqrt{f_c'}/f_y$, often taken as $= 1.38/f_y$

WSD

* 'Cracked' elastic section Analysis: $k = -n\rho_s + \sqrt{[2n\rho_s + (n\rho_s)^2]}$ $j = 1 - k/3$

Design: $k = n/(n + r)$ [where $r = f_{s(all)}/f_{c(all)}$] $j = 1 - k/3$

* Singly Reinforced Beam: $M_s = A_s f_s jd$ and $M_c = (f_c kj/2)\, bd^2 = R\, bd^2$
* When $M_s = M_c$, Steel Ratio $\rho_{sb} = k/2r$
* Doubly Reinforced Beam: $M_1 = Rbd^2$, $A_{s1} = M_1/(f_s jd)$
  $M_2 = M - M_1$, $A_{s2} = M_2/[f_s(d - d')]$ and $A_s' = M_2/[f_s'(d - d')]$, where $f_s' = 2f_s(k - d'/d)/(1 - k)$

USD

* $\alpha = 0.72 - 0.04\,(f_c' - 4)$, and $0.56 \le \alpha \le 0.72$, while $\beta = 0.425 - 0.025\,(f_c' - 4)$, and $0.325 \le \beta \le 0.425$
* Balanced Steel Ratio $\rho_b = (\alpha f_c'/f_y)\,\{87/(87 + f_y)\}$ and Maximum Steel Ratio $\rho_{max} = 0.75\rho_b$
* Design conditions: $M_u < \phi M_n$, $V_u < \phi V_n$, $P_u < \phi P_n$
  [$\phi = 0.90$ for moment, $\phi = 0.75$ for shear, $\phi = 0.70$ for axial forces]
  To calculate M_u, V_u, P_u, overload factors for DL, LL can be set as 1.2, 1.6 respectively.

* Singly Reinforced Analysis:
  If $\rho_s < \rho_b$ $a = A_s f_y/(0.85 f_c' b)$ $M_n = A_s f_y\,(d - a/2) = \rho_s f_y\,(1 - 0.59\,\rho_s f_y/f_c')\, bd^2$

* Doubly Reinforced Analysis:
  $a = A_{s1} f_y/(0.85 f_c' b)$ [where $A_{s1} = A_s - A_{s2}$, and can be taken as $= A_s - A_s'$ to begin with]
  $A_{s2} = A_s' f_s'/f_y$, where $f_s' = 87\,(c - d')/c \le f_y$,
  from which A_{s1} can be revised as $= A_s - A_{s2}$ and a can also be revised accordingly
  $M_n = A_{s1} f_y\,(d - a/2) + A_{s2} f_y\,(d - d')$

* Design: Singly Reinforced if $M_n < M_{max}$ [$= \rho_{max} f_y\,(1 - 0.59\,\rho_{max} f_y/f_c')\, bd^2$]
  $a = d\,[1 - \sqrt{\{1 - 2\,M_n/(f_c bd^2)\}}]$, $A_s = (0.85 f_c' ab)/f_y$
  Doubly Reinforced $M_1 = M_{max}$ $A_{s1} = \rho_{max} bd$,
  $M_2 = M_n - M_1$ $A_{s2} = M_2/f_y\,(d - d')$
  $c = A_{s1} f_y/(\alpha f_c' b)$ $f_s' = 87\,(c - d')/c \le f_y$ $A_s' = M_2/\{f_s'(d - d')\}$

T- and L-Beam

* T-beam b_{eff} is the minimum of $L/4$, $(16t + b_w)$, and (c/c distance between adjacent beams)
  L-beam b_{eff} is the minimum of $(L/12 + b_w)$, $(6t + b_w)$, and (b_w + half the clear distance between adjacent beams)
* USD Analysis: $A_{sf} = 0.85 f_c'(b_{eff} - b_w)t/f_y$
  $M_{nf} = A_{sf} f_y\,(d - t/2)$
  $A_{sw} = A_s - A_{sf}$ $a = A_{sw} f_y/(0.85 f_c' b_w)$ $M_{nw} = A_{sw} f_y\,(d - a/2)$
  } $\boxed{M_n = M_{nf} + M_{nw}}$

Design: $A_{sf} = 0.85 f_c'(b_{eff} - b_w)t/f_y$, $M_{nf} = A_{sf} f_y\,(d - t/2)$; while A_{sw} can be obtained from $M_{nw} = M_n - M_{nf}$

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2021
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) Indicate the chemical or chemicals (write the chemical formula with name) needed for each of the water treatment processes indicated below. Also, indicate the name of the precipitate if formed during the treatment process. (12)

Treatment	Chemical Added	Precipitate Formed
Coagulation-Flocculation		
Disinfection		
Softening (Hardness Removal) If water only has temporary hardness $Ca(HCO_3)_2$, $Mg(HCO_3)_2$		
Softening (Hardness Removal) If water only has $MgSO_4$		

(b) A **1,550m^3/hour** drinking water plant needs rapid mix basins for chemical addition. If the detention time is 60 seconds and the volume of the tank cannot exceed 8 m^3, estimate how many tanks will be needed. Calculate the power in watts that needs to be supplied to **each tank** if the velocity gradient G is 80 sec^{-1}. Assume that the absolute viscosity of the water is 8.91×10^{-4} Pascals.second. (8)

(c) Explain where (in water treatment flow chart) and for what purpose you will use pre-chlorination, post chlorination, and break-point chlorination. (6)

(d) You are to provide a treatment solution for the Balu River. Show in a flow diagram, which water treatment units would you propose to incorporate if the river has high suspended solids and turbidity? (4)

2. (a) Explain the problems of groundwater development in Bangladesh in the following contexts : (10)
The problem and its occurrence zones
i. The reason for the problem and the effects – relate to the water quality parameter involved and the standard guideline for the parameters

(b) The table below shows the properties of four types of soil. Mention which type of soil is (7)

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.

Soil type	Porosity (%)	Specific yield (%)
Clay	45	3
Gravel and sand	20	16
Sand	35	25
Gravel	25	22

(c) Which types of pipes would you choose if you need the following properties (you can mention more than one type of pipe for each property) in a pressure pipe for the conveyance of water : (5)

i. Good hydraulic properties
ii. High temperature resistant
iii. Free from corrosion
iv. Durable
v. Lightweight

(d) Explain 'water stability' through the "Bayliss curve" in a figure and make a comparison between "Corrosive water" and "Scale forming water." (8)

Given Formula:

I. $t_d = V/Q$

II. $G = \sqrt{(P/\mu V)}$

University of Asia Pacific

Department of Civil Engineering

Midterm Examination, Fall 2021

Program: B.Sc. Engineering (Civil)

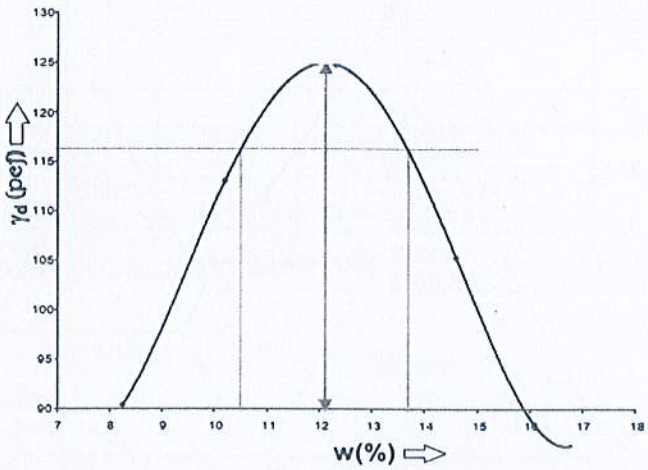
Course Title: Geotechnical Engineering I — Course Code: CE 341

Time: 1 hour — Credit Hour: 3.00 — Full Marks: 40

Answer all the questions below. For necessary additional information, check the appendix attached with the question.

(1) Explain briefly about gibbsite sheet and brucite sheet. Also, illustrate about the factors affecting hydraulic conductivity. **(2.5+2.5)**

(2) Figure out the degree of saturation of a soil, for the maximum dry density and O.M.C. specified in the following compaction curve. Given, specific gravity of the soil = 2.65. **(5)**



(3) For a saturated clay, moisture content = 40%+Last digit of your roll number. If specific gravity of the soil = 2.73, illustrate the porosity and saturated unit weight (in KN/m^3) of the soil. **(5)**

(4) The results of a sieve and a hydrometer analysis of a soil is given below.

Sieve No.	% passing
4	100
8	98
16	93
30	68
50	50
100	35
200	24

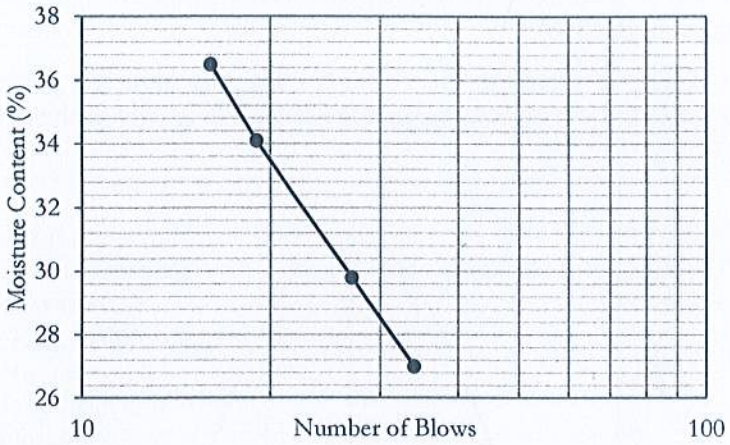
Grain Diameter (mm)	% passing
0.095	28
0.072	24
0.043	20
0.015	15
0.001	5

(a) Plot graphically the combined grain-size distribution curve. **(12)**

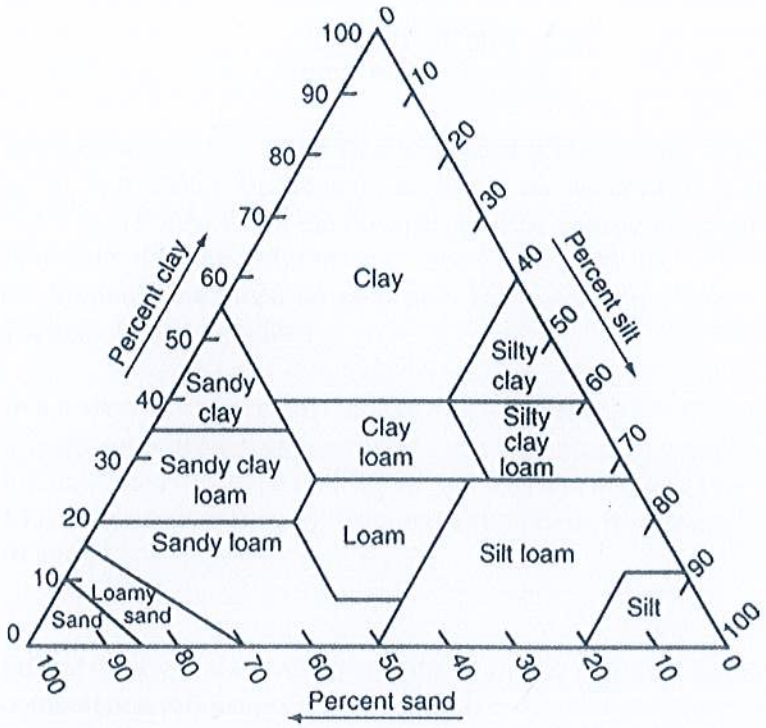
(b) Estimate the % of gravel, sand, silt and clay based on USDA Classification System. (5)

(c) Classify the soil according to the USDA Classification System (5)

(5) If the in-situ moisture content of a soil is 28% and plastic limit is 17%+Last digit of your roll number, analyze the liquidity index and consistency index of the soil. Take the necessary information from the following Atterberg limit curve. (3)



APPENDIX



U.S. Department of Agriculture textural classification (USDA)

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall – 2021
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 how you can physically identify whether the flow in an open channel is subcritical, critical or supercritical. **[5]**

   b) A bridge across a river has its piers placed symmetrically at the rate of 40 m center to center. Upstream of the bridge the water depth is 20 m and the velocity is 6 m/s. When the flow has gone far enough downstream to even out again after the disturbance caused by the piers, the water depth is 15 m. Compute the thrust on each pier. Neglect the bed slope and the bed friction. Assume $\alpha = \beta = 1$. **[10]**

   c) In a wide river the velocity varies along a vertical as $u = 4 (z/h)^{1/2}$ in, where h is the total depth and u is the velocity at a distance z from the channel bottom. The river is 10 m deep. i) Compute the discharge per unit width, ii) Clarify state of flow iii) Compute the velocity distribution coefficients (α and β). **[15]**

2. a) Derive the general expression for the hydraulic exponent for uniform flow computation (N) using Chezy's formula. **[8]**

   b) Calculate the critical depth and velocity in a trapezoidal channel with $b = 5$ m, $s = 1.5$, $\alpha = 1.12$ and $Q = 30$ m^3/s by Newton-Raphson method. **[12]**

   c) A trapezoidal channel has a bottom width of 6 m, side slopes of 1.5:1, $\alpha = 1.12$ and $n = 0.025$. (i) Determine the normal slope at a normal depth of 1 m when the discharge is 20 m^3/s. (ii) Determine the critical slope when the discharge is 20 m^3/s. **[10]**

Given Formula:

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

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

$Z_c = \frac{Q}{\sqrt{g}/\propto}$; $Z = AVD$; $h_c = \sqrt[3]{\frac{\alpha Q^2}{gb^2}}$

$Fr = U/\sqrt{(gD)}$; $Re = UR/v$

Continuity Equation

$Q = A_1U_1 = A_2U_2 = ...$

Energy Equation $z_1 + h_1 + \alpha_1u_1^2/2g = z_1 + h_1 + \alpha_2u_1^2/2g + h_f$

Momentum Equation $\rho Q(\beta_2U_2 - \beta_1U_1) = Fp_1 - Fp_2 - F$

Uniform flow formulae:

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

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

Course Title: Principles of Management | Course Code: IMG 301
Time: One hour | Credit Hour: Two | Full Marks: 20

(Answer any two of the following questions.)

1. (a) "This means that the entire organization is viewed as an interdependent system operating in many countries. The relationship between headquarters and subsidiaries are collaborative, with communication flowing in both directions." Which orientation of multinational corporations is it? 0.5
   (b) What percentage of Mazda's share Ford Motor Company purchased? 0.5
   (c) What stands for ASEAN? 0.5
   (d) What fraction of labor force enjoys job security in Japan? 0.5
   (e) Explain the functions of management with examples. 8

2. (a) Write advantages of and challenges for multinational corporations. 6
   (b) Draw the diagram of the relationship of objectives and the organizational hierarchy. 4

3. (a) Explain policies and procedures (two types of plans). 4
   (b) What is whistle-blowing? 2
   (c) What is the use of whistle-blower website? 2
   (d) Which type of corporation views the whole world as one market? 0.5
   (e) Which countries are included in North American Free Trade Agreement (NAFTA)? 0.5
   (f) "However, it adds to the business costs because employees are kept on the payroll even when there is insufficient work." What adds to the business costs? 0.5
   (g) Still in major decisions, --- management retains its power. (In Japan). Fill up the blanks. 0.5

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

Course Title: Structural Engineering II | Course Code: CE 313
Time: 1 hour | Credit Hour : 3.0 | Full Marks: 40

ANSWER ALL QUESTIONS. Any missing data can be assumed reasonably.

Part-A

1. Using Virtual Work (Unit Load) Method, find the horizontal and vertical deflection of joint **D** of the truss in ***Fig.1***
[Given: EA=Constant] [10]

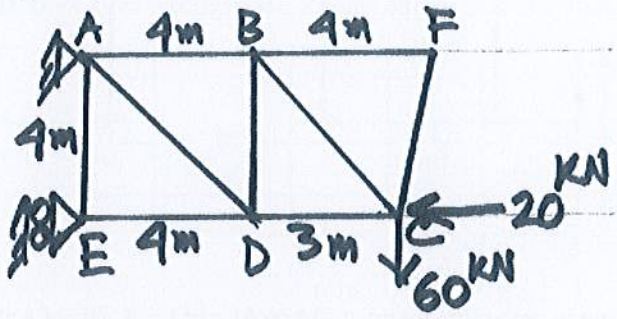


Fig.1

2. Using Virtual Work (Unit Load) method, calculate **(i)** the horizontal deflection at joint **C** and **(ii)** rotation of the free end **D** of the Frame in ***Fig.2***
[Given: EA=Constant] [10]

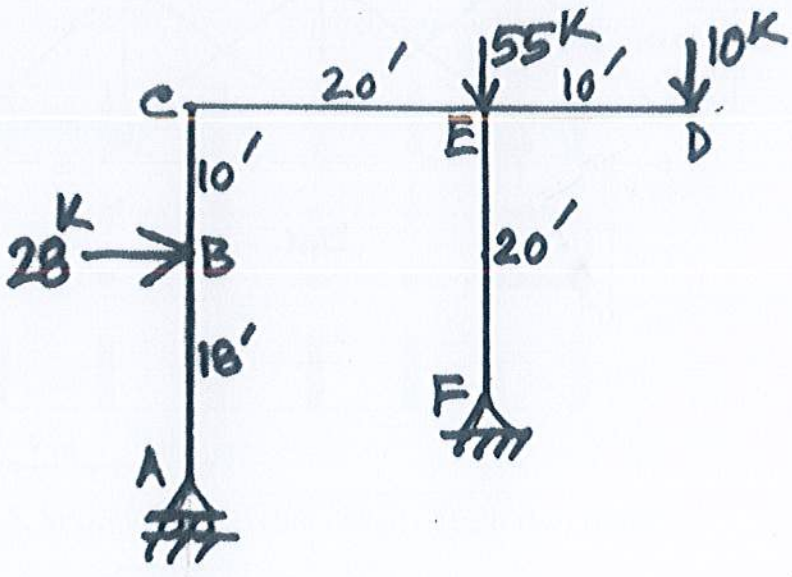


Fig.2