3-1

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2019
Program: B. Sc. Engineering (Civil)

Course Title: Open Channel Flow | Course Code: CE 361
Time- 1 hour | Full marks: 50

There are **Two** questions. Answer all the questions. *(20*2 = 40)*
[Assume reasonable data if any]

1. (a) How can you physically identify whether the flow in an open channel is subcritical, critical or supercritical? (5)

(b) Derive the Law of Torricelli. (5)

(c) Water flows in an open channel at a depth of 2.5 m and a mean velocity of 3m/s. Compute the discharge and determine the state of flow if the channel is i) triangular with s =2 and ii) circular whose diameter is 2.5 m. (10)

OR

In a wide river the velocity varies along a vertical as $u = 1 + 2z/h$, where h is the total depth and u is the velocity at a distance z from the channel bottom. The river is 5 m deep. Compute the numerical values of the velocity distribution coefficients α and β and the ratio $(\alpha-1)/(\beta-1)$.

2. (a) Establish the implications of the governing equation for uniform flow. (5)

OR

Derive the relationship between Chezy's C, Darcy Weisbach factor f and Manning's n.

(b) Derive the general expression for the hydraulic exponent for critical flow computation M. (5)

(c) Compute the critical depth and velocity in a circular channel with $d_0 = 3m$ and $Q = 5$ m^3/s by the trial and error method. (10)

OR

Water is flowing at a velocity of 2 m/s and a depth of 2.5 m in a long rectangular channel 4.5 m wide. Compute the height of a smooth upward step in the channel bed to produce critical flow. Also, compute the change in water level produced by the step. Neglect energy losses and take $\alpha = 1$.

Given Formula:

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

$$u^* = \sqrt{(gRS_0)}$$

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

$$Fr = U/\sqrt{(gD)}$$

$$Re = UR/\nu$$

Uniform flow formulae:

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

$$\bar{U} = \frac{\int_0^A u\, dA}{A}$$

$$\alpha = \frac{\int_0^A u^3\, dA}{\bar{U}^3 A}$$

$$\beta = \frac{\int_0^A u^2\, dA}{\bar{U}^2 A}$$

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2019
Program: B.Sc. Engineering (Civil)

Course Title: Structural Engineering I | **Course Code: CE 311**
Time: 1 hour | **Credit Hour : 3.0** | **Full Marks: 40**

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

1. Draw bending moment diagram for any one of the frames shown in ***Fig.1***.....**[10]**

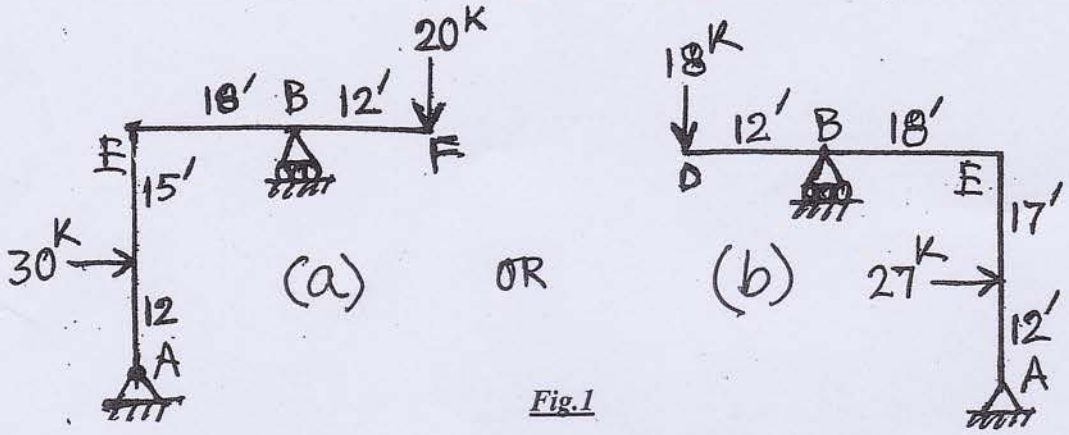


Fig.1

2. For the beam shown in ***Fig.2,*** draw influence line for : (i) Vertical Reaction at D, (ii) Shear forces at E and just left of D and (iii) Bending moments at D & E . **[12]**

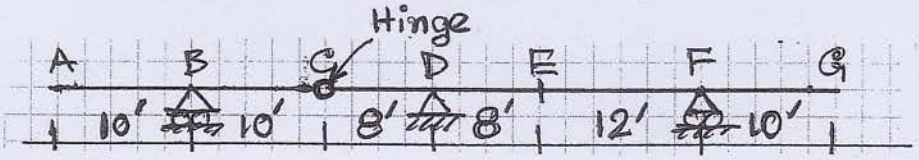


Fig.2

3. For the beam shown in ***Fig.3,*** draw influence line for: (i) Shear forces at B and D and (ii) Bending moments at B & D. **[10]**

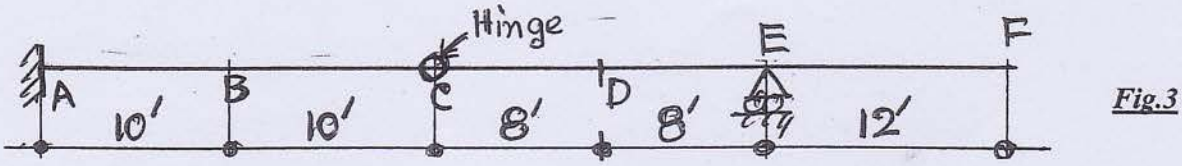


Fig.3

4. Determine whether the structures shown in ***Fig. 4*** are statically and geometrically stable or unstable. Also calculate the degree of statical indeterminancy ,if stable. **[8]**

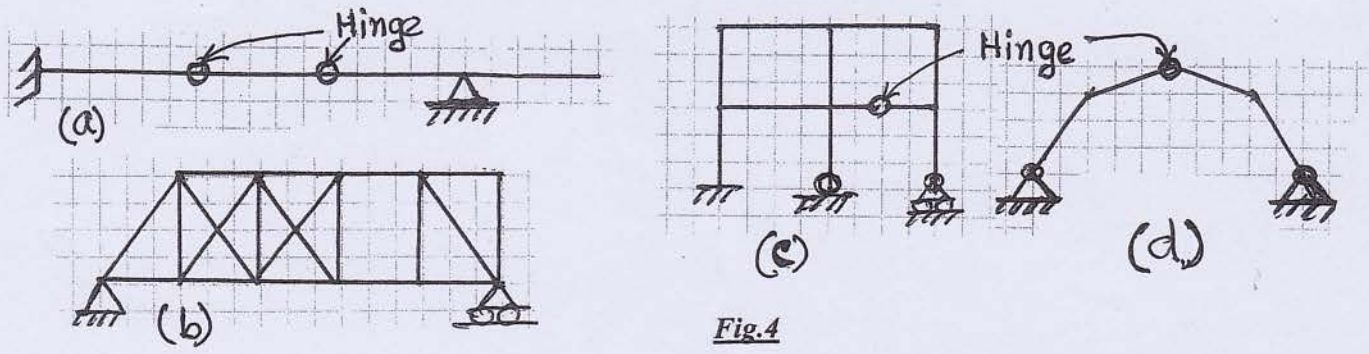


Fig.4

University of Asia Pacific
Department of Civil Engineering
Midterm Examination Fall 2019
Program: B.Sc. Engineering (Civil)

Course Title: Environmental Engineering I | Course Code: CE 331
Time: 1 hour | Full Marks: 30

There are Three Questions. Answer All the Questions.

1. (a) Derive the equation of well discharge for a confined aquifer **OR** an unconfined aquifer. [6]

   (b) What is fire demand? Calculate the fire demand for an area having population of 50 million. [1+3]

2. (a) The design period of a water supply system project is 40 years. Estimate the design population for that project with the following data using incremental increase method: [6]

Year	1975	1985	1995	2005	2015
Population (million)	10	12	16	20	23

   (b) What do you understand by the term "Design Period" for a water supply system project? Do you think selection of design period for such project is crucial? Justify your answer. [2+2]

3. (a) Explain the methods of aeration process for water treatment. What are the mechanisms that take place during the process? How can you increase the efficiency of an aerator? [2+2+2]

   (b) With a neat sketch show the different zones of a sedimentation tank. [4]

University of Asia Pacific
Department of Civil Engineering
Program: B.Sc. in Civil Engineering
Mid-Term Examination Fall 2019

Course Code: CE 315
Course Title: Design of Concrete Structures- I

Time: 1 (one) Hour
Full Marks: 60

*Answer **all** the questions. (**Assume** reasonable value for any **missing data**)*

1. (a) What is RC? Explain why steel and concrete are used in conjunction in RC. (10)

   (b) Show the variations of stress and strain over an RC section as it is stressed gradually from uncracked to cracked and ultimate failure condition. (5)

2. (a) The **Figure 1(i)** and **(ii)** below shows the bending moment diagram and section of a reinforced concrete beam respectively. Considering the value of w_o = 2 k/ft, design (concrete dimensions and steel area) the rectangular beam as a singly reinforced beam for the maximum positive moment. Given, f_c' = 4 ksi, f_y = 60 ksi, $\beta_1 = 0.80$, ϕ= 0.9 (15)

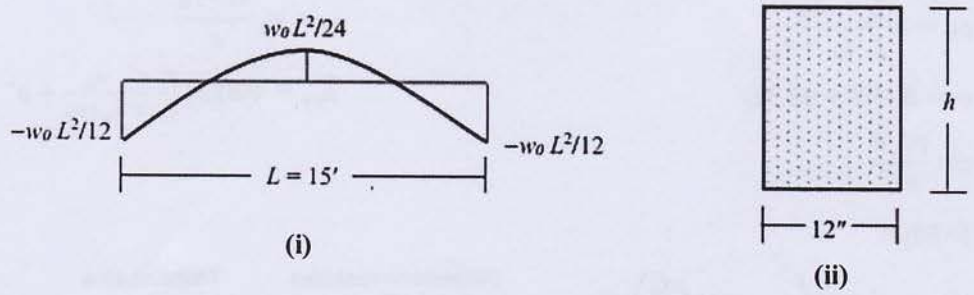


Figure: 1

   (b) Analyze the section shown in **Figure 2** to calculate the maximum allowable positive moment of the section at uncracked condition. Given, n=8, f_c' = 4 ksi, f_y = 60 ksi and the tensile strength of concrete in bending (modulus of rupture) is 475psi. (15)

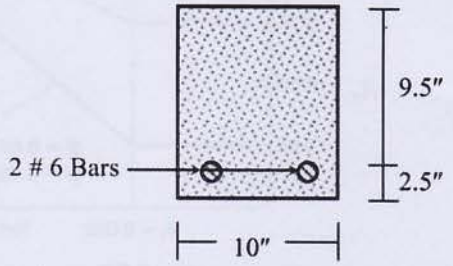


Figure: 2

3. Architectural considerations limit the height of a 20 feet long simple span beam to 16″ and a width to 12″. The ultimate moment (using factored loads) at midspan section of the beam is 179 kip-ft. Analyze the section to calculate the reinforcement for the beam. Given, f_c' = 5 ksi, f_y = 60ksi. (15)

Formulae

$P_c = f_c A_c$

$P_s = f_s A_{st}$

$f_s = nf_c$

$P = f_c[Ag + (n-1)A_{st}]$

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

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

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

$$\varphi = 0.483 + 83.3\epsilon_t$$

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

$f = My/I$

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

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

$A_s = \rho bd$

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

$$\rho' = A'_s / bd$$

$$M_{n1} = A'_s f_y (d - d')$$

$$M_{n2} = (A' - A'_s) f_y \left(d - \frac{a}{2}\right)$$

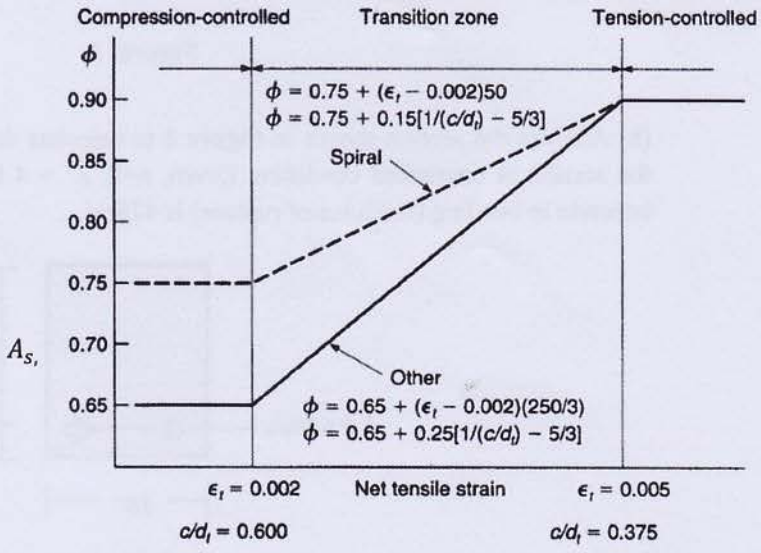
$$a = \frac{(A_s - A'_s) f_y}{0.85 f_c' b}$$

$c = a/\beta_1$

$$\bar{\rho}_{max} = \rho_{max} + \rho'$$

$$\epsilon_t = \epsilon_u \frac{dt - c}{c}$$

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



University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2019
Program: B.Sc. Engineering (Civil)

Course Title: Geotechnical Engineering I | Course No. CE 341 | Credit Hour: 3.00

Time: 1.00 Hour. | Full Mark: 60

Answer all the questions.

1. Given data:

   30% of total soil particles retained on No. 4 sieve
   60% soil particles is finer than 2.15 mm
   30% soil particles is finer than 0.65 mm
   90% soil particles is coarser than 0.15 mm
   Material in the pan = 6.3% of total soil
   Liquid limit = 38%
   Plastic limit = 25%

   i. Calculate the percentage of gravel and the percentage of sand within coarse grained soil portion. [4]

   ii. Classify the following soil according to Unified Soil Classification System (USCS). [16]

2. An individual footing (2m x 3m) transfers the column load to the soil layers, in Figure 1.

   i. Calculate the effective overburden pressure at the mid-depth of the clay layer. [5]

   ii. The footing is transferring a column load 1400 kN. Calculate the increase in stress at the mid-depth of the clay layer (use 2:1 stress distribution method). [5]

   iii. The footing is transferring a column load 1400 kN. Calculate the increase in stress using influence factor chart.

   a. Centre of the footing and at the mid-depth of the clay layer [5]

   b. Horizontally 1 m away from the corner of the footing (along the length side) and at the depth 10 m below the ground level. [5]

   iv. Calculate settlement of the clay layer due to the increase in stress at the centre of the footing due to 1400 kN of column load. [20]

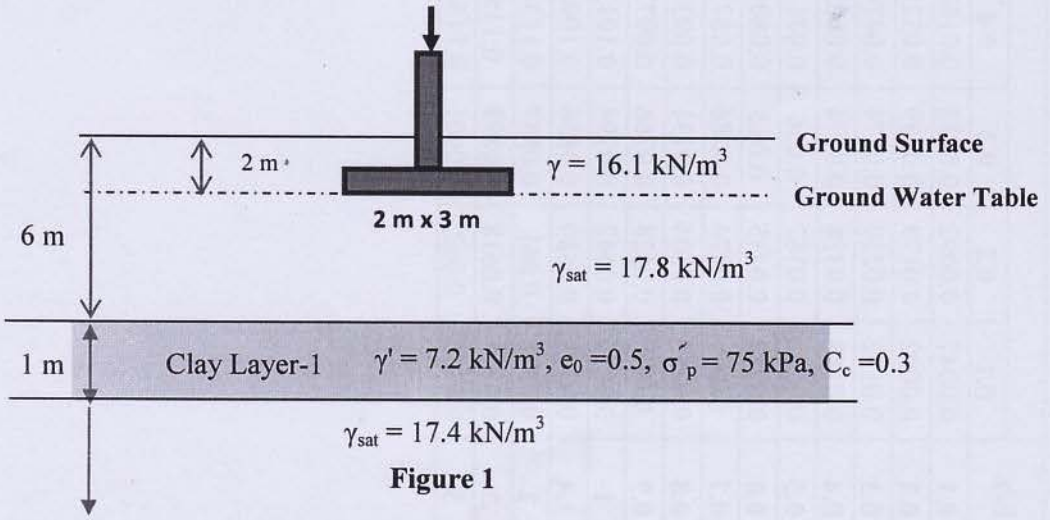


Figure 1

Table 2: Influence factor chart under the corner of a uniformly loaded rectangular area

L/z	B/z													
	0.1	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**	**1**	**1.4**	**2**	**3**	**5**
0.1	0.0047	0.0092	0.0132	0.0168	0.0198	0.0222	0.0242	0.0258	0.027	0.0279	0.0301	0.0311	0.0315	0.0316
0.2	0.0092	0.0179	0.0259	0.0328	0.0387	0.0435	0.0474	0.0504	0.0528	0.0547	0.0589	0.061	0.062	0.062
0.3	0.0132	0.0259	0.0374	0.0474	0.056	0.063	0.0686	0.0731	0.0766	0.0794	0.0856	0.0887	0.0898	0.0901
0.4	0.0168	0.0328	0.0474	0.0602	0.0711	0.0801	0.0873	0.0931	0.0977	0.1013	0.1094	0.1134	0.115	0.1154
0.5	0.0198	0.0387	0.056	0.0711	0.084	0.0947	0.1034	0.1104	0.1158	0.1202	0.13	0.135	0.1368	0.1374
0.6	0.0222	0.0435	0.062	0.0801	0.0947	0.1069	0.1168	0.1247	0.131	0.1361	0.1475	0.1533	0.1555	0.1561
0.7	0.024	0.0474	0.0686	0.0873	0.1034	0.1168	0.1277	0.1365	0.1436	0.1491	0.162	0.1686	0.1711	0.1719
0.8	0.0258	0.0504	0.0731	0.0931	0.1104	0.1247	0.1365	0.1461	0.1537	0.1598	0.1739	0.1812	0.1841	0.1849
0.9	0.027	0.0528	0.0766	0.0977	0.1158	0.1311	0.1436	0.1537	0.1619	0.1684	0.1836	0.1915	0.1947	0.1956
1	0.0279	0.0547	0.0794	0.1013	0.1202	0.1361	0.1491	0.1598	0.1684	0.1752	0.1914	0.1999	0.2034	0.2044
1.4	0.0301	0.0589	0.0856	0.1094	0.13	0.1475	0.162	0.1739	0.1836	0.1914	0.2102	0.2206	0.225	0.2263
2	0.0311	0.061	0.0887	0.1134	0.135	0.1533	0.1686	0.1812	0.1915	0.1999	0.2206	0.2325	0.2378	0.2395
3	0.0315	0.0618	0.0898	0.115	0.1368	0.1555	0.1711	0.1841	0.1947	0.2034	0.225	0.2378	0.242	0.2461
5	0.0316	0.062	0.0901	0.1154	0.1374	0.1561	0.1719	0.1849	0.1956	0.2044	0.2263	0.2395	0.2461	0.2486

University of Asia Pacific
Department of Civil Engineering
Mid-Semester Examination Fall-2019
Program: B. Sc. in Civil Engineering

Course Title: Principles of Accounting Course No. ACN 301 Credit: 2.00
Time: 1.00 Hour Full Mark: 20

[Answer all the questions]

1. As a going-to be-graduate from Civil Engineering, how do you think that knowledge in accounting would benefit you in your career? **2**

2. Michelle Rodriguez started her own consulting firm, Rodriguez Consulting, on May 1, 2018.The following transactions occurred during the month of May.

May 1 Michelle invested $7,000 cash in the business.
3 Purchased $600 of supplies on account.
5 Paid $125 to advertise in the County News.
9 Received $4,000 cash for services provided.
12 Withdrew $1,000 cash for personal use.
15 Performed $6,400 of services on account.
20 Paid for the supplies purchased on account on May 3.
23 Received a cash payment of $4,000 for services provided on account on May 15.
26 Borrowed $5,000 from the bank on a note payable.
29 Purchased office equipment for $3,100 on account.

Instruction
Show the effects of the previous transactions on the accounting equation using the following format.

	Assets				= Liabilities		+ Owner's Equity			
Date	Cash	+ Accounts Receivable	+ Supplies	+ Office Equipment	= Notes Payable	+ Accounts Payable	+ M. Rodriguez, Capital	− M. Rodriguez, Drawing	+ Revenues	− Expenses

8

3. Holz Disc Golf Course was opened on March 1 by Ian Holz. The following selected events and transactions occurred during March.

Mar. 1 Invested $20,000 cash in the business.
3 Purchased Rainbow Golf Land for $15,000 cash.
5 Paid advertising expenses of $900.
10 Purchased golf discs and other equipment for $1,050 from SGS Firm payable in 30 days.
18 Received $1,100 in cash for golf fees (Holz records golf fees as service revenue).
30 Paid SGS Firm in full.

31 Received $2,700 cash for golf fees.

Holz Disc Golf uses the following accounts: Cash (101), Land (107), Equipment (205), Accounts Payable (177), Owner's Capital (213), Owner's Drawings (214), Service Revenue (215), Advertising Expense (216).

Instruction

i. Journalize the March transactions. **5**

ii. Post them to the Ledger. **5**

OK. Rakiv 04.12.19