University of Asia Pacific
Department of Civil Engineering
Mid Term Examination
Fall 2016
Program: B.Sc. Engineering (Civil)

Course Title: Geotechnical Engineering I | **Course Code**: CE 341
Time: 1 hour | **Full Marks**: 20

Answer all the questions. **(4x5=20 marks)**

1. Given Data:
   Percent finer than 0.075 mm = 10.5
   Percent retained on No. 4 sieve = 38
   $C_u = 4.8$ & $C_c = 1.5$
   Liquid limit = 35%
   Plastic limit = 25%

   (i) Determine whether the soil data is correctly classified as SW-SC, based on the Unified Soil Classification System. Provide the appropriate reason(s). 1.5
   (ii) If not, reconstruct the USCS classification of the given soil? 2.5
   (iii) What modification(s) in soil data can justify the previous classification? 1

2. (i) Direct shear tests were conducted on cohesionless soil specimens. Given that peak and ultimate shear strengths were obtained 150 kPa and 120 kPa, while normal stress of 180 kPa was applied.
   (a) Determine the angle of internal frictions for both the states applying the Mohr-Coulomb failure theory. 2
   (b) Write down the Mohr Coulomb failure equations for both peak shear failure and ultimate shear failure. 1

   (ii) At the end of the unconfined test,
   Diameter = 4 cm; Height = 8 cm.
   The axial strain was measured 15%, when the compressive load applied on the specimen was 78 N. 2
   Draw the Mohr circle of the unconfined compressive strength test. Interpret the undrained shear strength, cohesion and unconfined compressive strength of the soil sample.

3. The Mohr circles, drawn from three tri-axial test results are presented in the following figure. When confining pressure and deviator stress were applied, water from the soil specimen was allowed to drain out.
   In sieve analysis, only 3.5% of the total soil material was found in the pan.
   (i) Describe the test conditions at-failure for each test (Mention about confining pressure & deviator stress) 1.5
   (ii) Apply the sieve analysis results in obtaining the Mohr-Coulomb failure envelop. Justify your answer. 2
   (iii) Determine the shear strength parameters. Are these effective stress or total stress parameters? 1.5

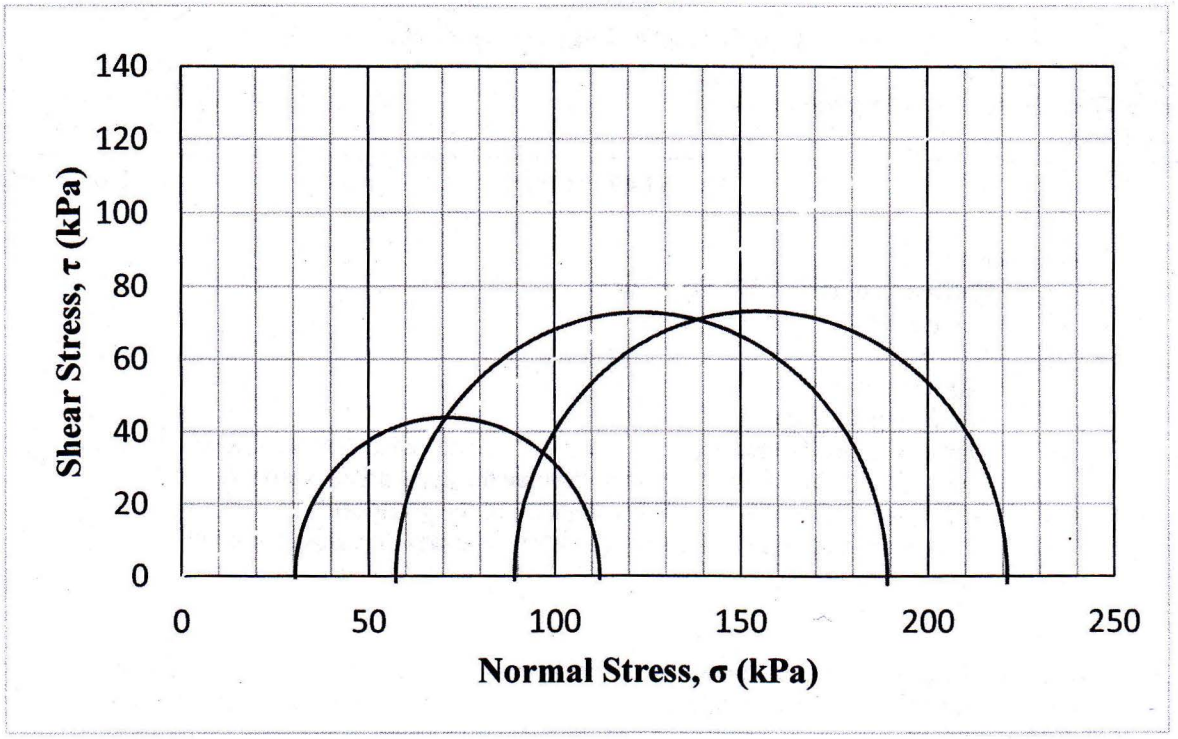


Figure 1: Mohr-Circles from three tri-axial tests

4. For the vertical stress diagram, given in Figure 2,
   (a) Calculate the unit weight of the three layers; 1.5
   (b) Identify the given stress diagram as total stress or effective stress & explain; 1
   (c) Calculate the total stress at the mid-levels of Layer-2 & Layer-3. 2.5

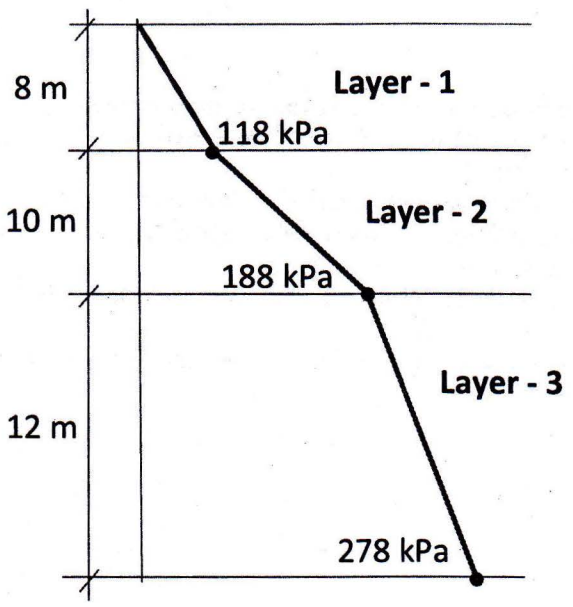


Figure 2

University of Asia Pacific
Department of Civil Engineering
Midterm Examination, Fall-2016
Program: B.Sc. Engg (3rd year 1st semester)

Course Title: Principles of Accounting **Course: ACN 301** **Credit : 2.0**
Time : 1 hour **Full marks : 20**

[Answer all Questions]

Q.1. Noah Consultants Ltd. has a fiscal year ending on September 30, 2016. Selected data from the September 30 adjusted trial balance are presented below.

NOAH CONSULTANTS LTD.
Adjusted Trial Balance
For the Year Ended September 30, 2016

	Dr.	Cr.
Cash	41,400	
Supplies	2,200	
Prepaid Insurance	10,900	
Land	80,000	
Equipment	120,000	
Accumulated Depreciation—Equip.		42,200
Accounts Payable		14,600
Unearned Ticket Revenue		1,000
Mortgage Payable		50,000
Owner's Capital		109,700
Owner's Drawings	14,000	
Consultancy Revenue		280,200
Salaries and Wages Expense	105,000	
Maintenance and Repairs Expense	30,500	
Advertising Expense	9,400	
Utilities Expense	16,900	
Property Tax Expense	21,000	
Interest Expense	10,000	
Insurance Expense	21,000	
Supplies Expense	16,400	
Interest Payable		4,000
Depreciation Expense	6,000	
Property Taxes Payable		3,000
TOTAL	504,700	504,700

Instruction:

A. **Prepare an income statement for the year ended, September 30, 2016.**
B. **Prepare an Owner's equity statement for the year ended, September 30, 2016.**
C. **Prepare a Balance Sheet at September 30, 2016.** **(3+3+6)**

Q.2. Desiree Clark runs a consultancy firm. During the first month of operations of her business, the following events and transactions occurred.

May 1 Clark invested $20,000 cash in her business.
2 Hired a secretary-receptionist at a salary of $2,000 per month.
3 Purchased $2,500 of supplies on account from Read Supply Company.
11 Provided design service and billed client $3,200 for services provided.
12 Received $3,500 advance on a consulting engagement.
17 Received cash of $1,200 for services completed for C. Desmond Co.
31 Paid secretary-receptionist $2,000 salary for the month.
31 Paid 60% of balance due Read Supply Company.

Desiree uses the following chart of accounts: No. 101 Cash, No. 112 Accounts Receivable, No. 126 Supplies, No. 201 Accounts Payable, No. 209 Unearned Service Revenue, No. 301 Owner's Capital, No. 400 Service Revenue, No. 726 Salaries and Wages Expense, and No. 729 Rent Expense.

Instructions
Journalize the transactions. **(8)**

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination, Fall 2016
Program: B. Sc. Engineering (Civil)

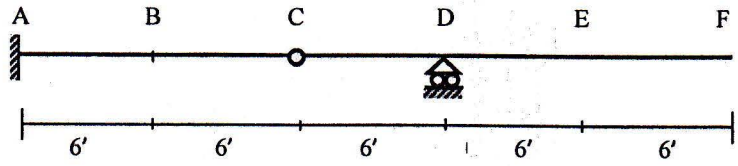
Course Title: Structural Analysis & Design I — Course Code: CE 311
Time: 1.00 Hour — Full Marks: 30 (=10×3)

*Answer any **three (03)** of the following **four (04)** questions.*
Assume any missing data reasonably.

1. Draw influence lines for [10]

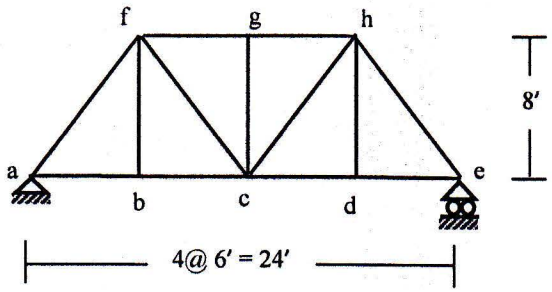
(a) Bending moment at A
(b) Bending moment at B
(c) Shear force at the left of D
(d) Shear force at B
(e) Vertical reaction at D

for the beam shown below

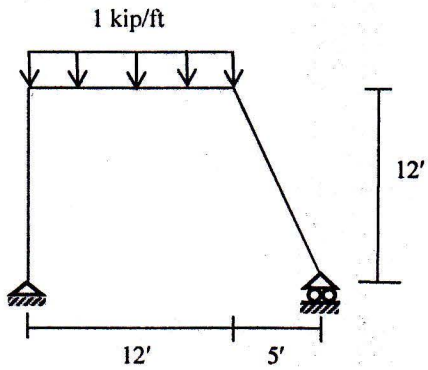


2. For the truss shown below, draw the influence lines for bar forces in member gh, fc, gc, hd and cd [10]

[Load moves over the bottom chord].

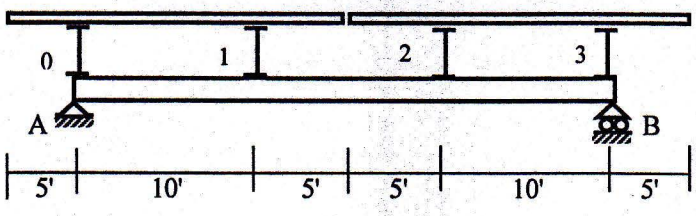


3. Draw the shear force and bending moment diagrams for the frame shown in figure below. [10]



4. Girder AB supports a floor system as shown in the figure below. Draw the Influence lines for [10]

(i) Bending moment at panel point 1
(ii) Support reaction at "A"
(iii) Shear in panel 1-2



3-1

University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Fall 2016
Program: B. Sc. Engineering (Civil)

Course Title: Open Channel Flow | Course Code: CE 361
Time- 1 hour | Full marks: 60

There are **FOUR** questions. Answer any **THREE** questions. *(20*3 = 60)*

1. (a) Derive expressions to compute each of the velocity distribution coefficients. (6)

   (c) For a trapezoidal channel with b = 6 m and s = 2, compute the critical depth by either the method of bisection or Newton-Raphson method if Q = 14 m^3/s and $\alpha = 1$. (14)

2. (a) What are the principles that each of the governing equations for steady one-dimensional flow is based on? Specifying the various forces acting on a control volume in longitudinal direction of a channel, derive the momentum equation for one – dimensional steady flow. (4+4)

   (c) Water flows at a velocity of 2.0 m/s and a depth of 2.5 m in a long rectangular channel which is 6.0 m wide. Compute the height of a smooth upward step in the channel bed to produce critical flow. Also calculate the depth of flow produced by a smooth upward step of 0.40 m. Assume $\alpha = 1.0$. (6+6)

3. (a) Derive a general expression for Hydraulic Exponent (M) for Critical Flow Condition. By using the derived expression, compute the hydraulic exponent (M) for a trapezoidal channel with b = 10 m, s = 2 and h = 2 m. (6+4)

   (b) 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. (i) Compute the discharge per unit width, and (ii) determine the state of flow. (10)

4. (a) State the conditions that are applicable for uniform flow. (4)

   (b) Define "Laminar or Viscous sublayer". Discuss the classification of different types of boundaries on the basis of roughness elements and viscosity. (7)

   (c) An open channel lined with concrete (d_{50} = 1.5 mm) is laid on a slope of 0.1%. The channel is trapezoidal with b = 6 m and s = 2. Compute the uniform flow discharge in the channel if the depth of flow is 2 m. Also compute the numerical values of Chezy's C and friction factor f. (9)

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2016
Program: B.Sc. Engineering (Civil)

Course Title: Design of Concrete Structures I | Course Code: CE 315(A)
Time: 1 hour | Full Marks: 40

(Answer all the questions)

1. For the beam cross section shown in **Figure 1**, determine whether failure of the beam will be initiated by crushing of concrete or yielding of steel. Also, calculate the design moment capacity (M_u) of the beam. Given, f'_c=7,000 psi, f_y=60,000 psi [8]

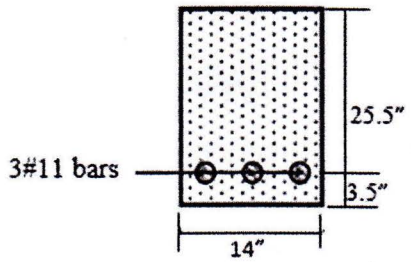


Figure 1

2. A rectangular beam carries a service live load (unfactored) of 2.0 k/ft and an unfactored superimposed dead load of 1.5 k/ft on a 22 ft simple span as shown in **Figure 2**. The beam will have a cross-section of 14" x 22" for architectural reasons. Design the beam for flexure. Assume, d'=2.5", f'_c=3 ksi, f_y=60 ksi [15]

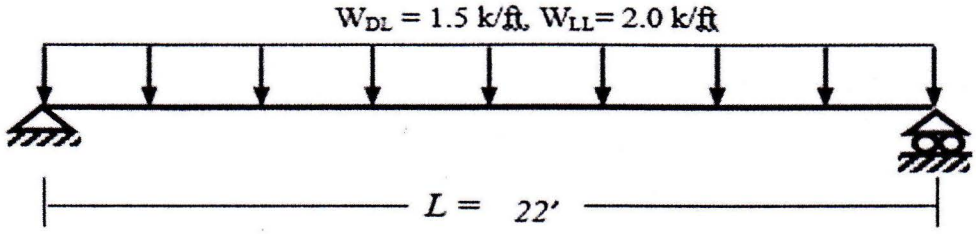


Figure 2

3. Compute the load P that will produce the first crack at the section B of the RC cantilever beam AB shown in **Figure 3**. Consider self-weight of beam for your calculation. Given, f'_c=4 ksi, f_y=60 ksi [7]

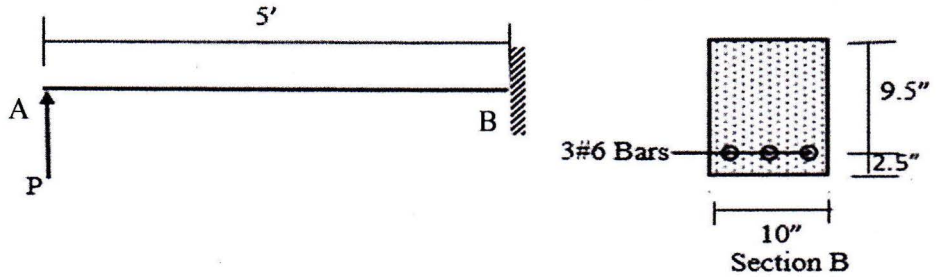


Figure 3

4. Calculate the ultimate compression and tensile force capacity of the RC column section shown in **Figure 4**. Also, calculate the stresses and corresponding strain in concrete and steel when the section is subjected to one-fifth its ultimate load. Given, , f_c'=4 ksi, f_y=50 ksi [10]

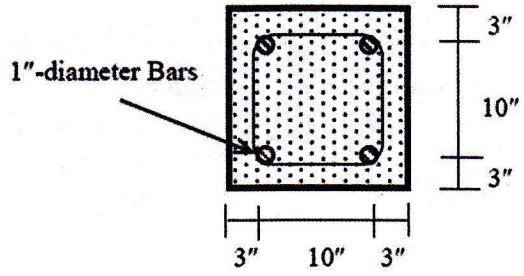


Figure 4

Formulae:

1. $P_c = f_c A_c + f_s A_{st}$
2. $P_c = f_c [A_g + (n-1) A_{st}]$
3. $P_{nc} = 0.85 f_c' A_c + f_y A_{st}$
4. $P_t = f_t [A_g + (n-1) A_{st}]$
5. $P_{nt} = f_y A_{st}$
6. $k = -\rho n + \sqrt{\{(2\rho n + (\rho n)^2\}}$
7. $j = 1 - k/3$
8. $E_c = 57500\sqrt{f_c'}$
9. $f_T = 6\sqrt{f_c'}$
10. $M_c = 0.5 f_c k j b d^2$
11. $M_s = f_s j d$
12. $a = \frac{A_{sf_y}}{0.85 f_c' b}$
13. $\rho_b = \frac{0.85\beta_1 f_c'}{f_y} \times \frac{\epsilon_u}{\epsilon_u + \epsilon_s}$
14. $\rho_t = \frac{0.85\beta_1 f_c'}{f_y} \frac{\epsilon_u}{\epsilon_u + \epsilon_t}$
15. $\rho_{min} = \frac{3\sqrt{f_c'}}{f_y} \geq \frac{200}{f_y}$
16. $M_{n1} = A_S f_S (d-d')$
17. $M_{n2} = (A_S - A_S')f_s(d - \frac{a}{2})$
18. $A_{s'} = \frac{M_{n2}}{f_s'(d-d')}$
19. $\phi = 0.483 + 83.3\epsilon_t$
20. $0.85 f_c' \beta_1 bc + A_s' \epsilon_u E_S (c-d')/c = A_s f_y$
21. $M_u = \emptyset \rho f_y b d^2 \left(1 - \frac{0.59\rho f_y}{f_c'}\right)$

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination -Fall 2016
Program: B.Sc. Engineering (Civil)

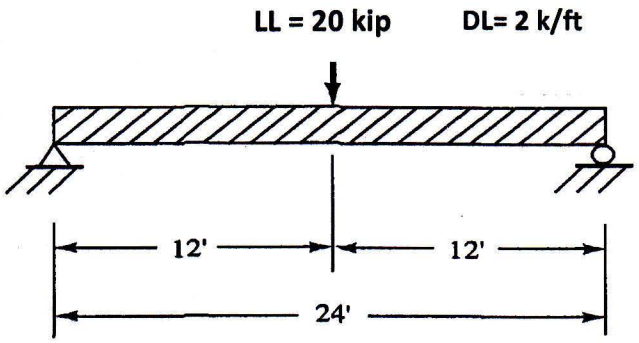
Course Title: Design of Concrete Structures I — Time: 1 hour
Course Code: CE 315(B) — Full Marks: 40

[Answer all the three (03) questions]

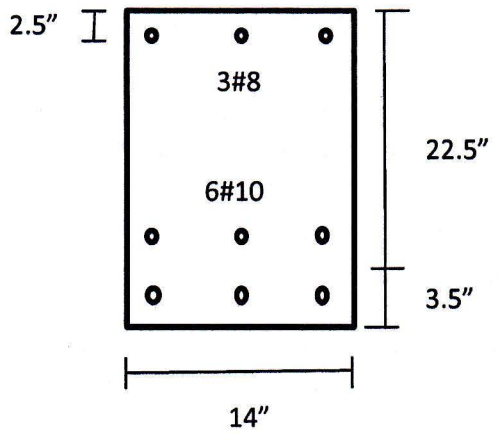
1. (a) What are the fundamental assumptions for reinforced concrete behavior? **(05)**

(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.? **(05)**

2. A rectangular beam is to be designed (concrete dimensions and steel area) using $f'_c = 4$ ksi and $f_y = 60$ ksi. There exist a uniformly distributed DL of 2 k/ft and a concentrated 15 kip LL. Use, b= 12inch and #9 bar. **(14)**



3. In the figure shown below, calculate the ultimate positive moment capacity of the following beam. Follow USD method. [Given that $f'_c = 5$ ksi, $f_y = 60$ ksi,] **(16)**



Formula

$P = A_c f_c + A_s f_s$

$P = f_c\{A_g + (n-1)A_s\}$

$P = 0.85 f_c' A_c + A_s f_y$

$P = A_c f_{ca} + A_s f_s$

$P = A_s f_y$

$E_c = 57000\sqrt{f_c'}$

$f_r = 7.5\sqrt{f_c'}$

$M_c = 0.5kjbd^2 f_c$

$M_s = A_s f_s jd$

$k = -\rho n + \sqrt{\{(2\rho n + (\rho n)^2\}}$

$j = 1 - k/3$

$\rho_b = \frac{\alpha f_c'}{f_y} \frac{\varepsilon_u}{\varepsilon_u + \varepsilon_y}$

$\rho_{max} = \frac{\alpha f_c'}{f_y} \frac{\varepsilon_u}{\varepsilon_u + \varepsilon_t}$

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

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

$\gamma f_c' ab = A_s f_y$

$\rho_{min} = \frac{1.8\sqrt{f_c'}}{f_y} \geq \frac{200}{f_y}$

$\varepsilon_t = \frac{-c + d_t}{c} \varepsilon_u$

$M_{1n} = A_s' f_y (d - d')$

$M_{2n} = (A_s - A_s') f_y (d - \frac{a}{2})$

$0.85 f'_c ab = (A_s - A_s') f_y$

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

$\bar{\rho}_{cy} = \gamma\beta_1 \frac{d'}{d} \frac{f_c'}{f_y} \frac{\varepsilon_u}{\varepsilon_u - \varepsilon_y} + \rho'$

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

$\Phi = 0.483 + 83.3\varepsilon_t$

Table 1 Bar diameter and area of bar

d (No.)	2	3	4	5	6	7	8	9	10
A_s (in^2)	0.05	0.11	0.20	0.31	0.44	0.60	0.79	1.00	1.27
d (mm)	8	10	12	16	19	22	25	28	31
A_s (in^2)	0.08	0.12	0.18	0.31	0.44	0.59	0.76	0.95	1.17

University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Fall 2016
Program: B.Sc. Engineering (Civil)

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

There are Four (4) questions. Answer any Three (3). Assume any data if required.

1. (a) With a neat diagram show the elements of a water supply system. What is the function of distribution reservoirs in water supply systems? **[5]**
   (b) Enlist the steps required for planning a municipal water supply system. **[5]**

2. (a) With an example describe how instantaneous demand may influence overall water demand pattern in a city. **[5]**
   (b) In a residential area of 200,000 inhabitants, the specific water demand is estimated at 250 l/c/d, which includes leakage. Calculate the demand in 25 years time if the assumed annual demand growth is 2.5%. Compare the results by applying the linear and exponential models. Use the following equations, if required: **[5]**

$$Q_{i+n} = Q_i\left(1+n\frac{a}{100}\right) \qquad Q_{i+n} = Q_i(1+\frac{a}{100})^n$$

3. (a) Explain the distribution of Earth's water. With a neat diagram describe confined and unconfined aquifers. **[5]**
   (b) Explain the criteria for selecting screen length. **[5]**

4. (a) For water supply of a town, water is pumped from a river 4 km away into a reservoir. The max^m level difference of river and reservoir is 25m. Town population is 90,000 and per capita water demand is 120 lpcd. If the pumps operate for a total of 8 hrs and pump efficiency is 70%, calculate pump B.H.P Assume friction factor as 0.0075 and pipe velocity as 2m/s and max^m daily demand as 1.5 times avg. daily demand. **[5]**
   (b) Describe pumps according to the class of service. **[5]**

Given Formula:

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

1. **Hydraulically smooth surface:** $\frac{U}{u^*} = 5.75\ log\ (\frac{3.64u^*R}{v})$

2. **Hydraulically rough surface:** $\frac{U}{u^*} = 5.75\ log\ (\frac{12.2R}{k_s})$

3. **Transition regime:** $\frac{U}{u^*} = 5.75\ log\ (\frac{12.2R}{k_s + 3.35\frac{v}{u^*}})$