3-1

University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2013
Program: B. Sc. Engineering (Civil)

Course Title: Environmental Engineering I **Course Code: CE 331**
Time: 3 hour **Full marks: 100**

Question No. 6 is compulsory. Answer any FOUR from the rest.
(Note: Assume any missing data and answer as per given notes.)

1. (a) Discuss briefly the coagulation and flocculation theory and process in conventional water treatment process. (12)

   (b) Explain **"Use screen length as a controlling factor".** (3)

   (c) Results of chlorine demand test on a raw water are given below: (5)

Sample no.	Chlorine dosage (mg/lt)	Residual chlorine after 10 min contact(mg/lt)
1.	0.2	0.19
2.	0.4	0.36
3.	0.6	0.50
4.	0.8	0.48
5.	1.0	0.2
6.	1.2	0.4
7.	1.4	0.6
8.	1.6	0.8

   Sketch a "chlorine demand curve". What is the "break point dosage" and what is the "chlorine demand" at dosage of 1.2 mg/lt ?

2. (a) Discuss briefly the disinfecting action of chlorine in water treatment process. (9)

   (b) Define rain water, ground water, potable water and palatable water. (4)

   (c) Write down the advantages of pressure pipe over gravity pipe. (3)

   (d) What are the short comings of Tara pumps ? (4)

3. (a) Classify the impurities in water according to the source of origin and form of presence. (9)
   (note: show the classification in a table format)

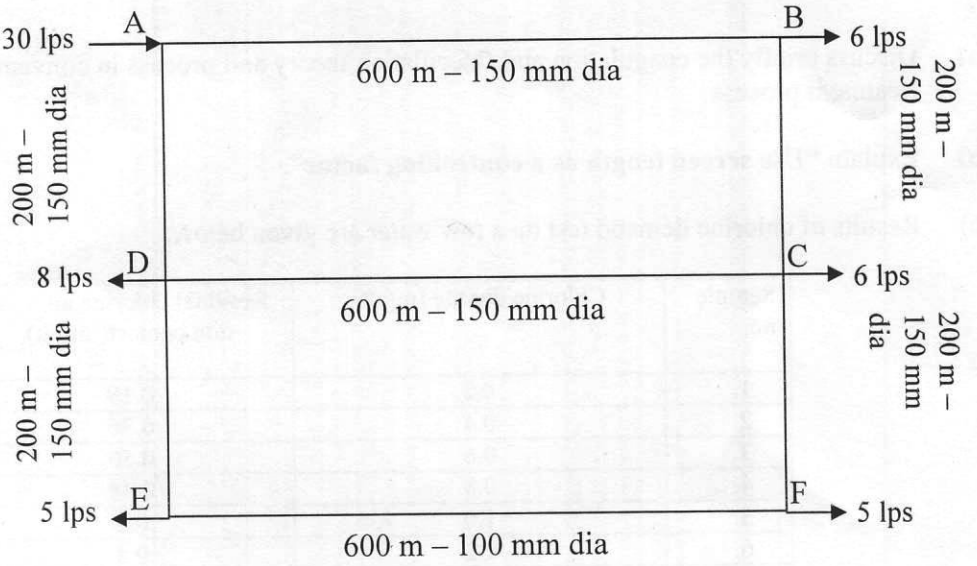
   (b) Write down the important considerations for selection of site for intake structures. (6)

   (c) The discharge of water flowing from a reservoir into a 1m dia steel pipe is 1.6 m^3/sec. If a valve is situated in the pipe-line at a point 2 km from the reservoir , evaluate water hammer pressure developed by the closure of this valve, if (5)

I. The closure time is 2.8 sec
II. The closure time is 5.5 sec

The thickness of the pipe –shell may be taken to be 2.5 cm.

4. (a) Calculate the flow in each of the pipes in the following looped pipe network (using Hardy Cross method and two trials are required): (20)



5. (a) What is the principle of particles to settle in sedimentation tank during sedimentation process ? What are parameters that the settling velocity of the particles depend upon ? (3+3)

(b) Differentiate between slow sand filter (SSF) and rapid sand filter (RSF). (4)

(c) Differentiate between working pressure, design pressure and test pressure in a pipe. (5)

(d) A rapid sand filter is to be designed for a capacity of 30,000 m^3/day. What should be the number and size of the units ? Calculate the percentage of filtered water required to wash the filter bed and the capacity of the wash water tank. (5)

[Assume : Rate of filtration : 5 $m^3/hr/m^2$
Rate of washing : $35 m^3/hr/m^2$
Length of the filter run: 23.67 hrs while 8 min. and 12 mins are required. for filter washing and resettlement of sand bed respectively]

6. (a) Design a tube well of a suitable aquifer for extracting drinking water at a depth from 280 ft to 340 ft. In the following graph the co-ordinates should be identified. (20)
(Summary of grain size test report, gradation chart & all relevant data are given below).

The necessary equations are given below:

1. $U_P = \sqrt{(E_W/\rho)}.\ 1/\sqrt{(1+ E_W/E_P.d/t)}$ 2. $P_h = P_h(max)\ (T_C/T)$ 3. $T_C = 2S/U_P$

Summary of Grain Size Test Results:

Sample depth	D_{10}	D_{30}	$U= D_{60}/D_{10}$	% of Coarse Sand	% of Medium Sand	% of Fine Sand	FM
(ft)	mm	mm		%	%	%	
240	0.17	0.25	1.4	0.5	89.5	20	1.5
260	0.18	0.24	1.46	0.5	89.5	20	1.49
280	0.2	0.3	1.3	4	86	10	1.68
300	0.15	0.24	1.58	12	68	20	1.60
320	0.18	0.25	1.52	2	82	16	1.56
340	0.18	0.27	1.11	10	75	15	1.67
360	0.15	0.22	1.55	1	76	23	1.38
380	0.16	0.21	1.38	0.5	75	24	1.30

The relevant size of sieves

Sieve No.	Size (mm)
4	4.75
8	2.36
16	1.18
30	0.6
40	0.425
50	0.3
100	0.15
200	0.075

Note: Complete the gradation chart and attach it with the exam paper.

(The co-ordinates should be identified in graph.)