B.E / B.Tech DEGREE END SEMESTER EXAMINATIONS, NOV/DEC 2011

CIVIL ENGINEERING BRANCH

FIFTH SEMESTER – (REGULATIONS 2008)

CE 9304 –WATER SUPPLY ENGINEERING

Time : 3 hours Max. Mark : 100

Instructions:

(i) Part A carries a maximum of 20 marks and Part B carries a maximum of 80 marks.

(ii) All Questions in Part A carries 2 marks each and all questions in Part B carries 16 marks each.

(iii) Make suitable assumptions wherever necessary and state them clearly.

PART – A (10 x 2 = 20 Marks)

1. State the significances and drinking water quality standards of the following water- quality parameters.
   i)Iron
   ii)Fluoride
2. List the various water – borne diseases caused by Bacteria and Virus.
3. Write a brief note on different types of pipe materials used for conveying water in water supply scheme.
4. What is the recommended per capita water supply level for designing the following.
   (i)Metropolitan Cities
   (ii)Cities provided with piped water supply with sewerage system
   (iii)Town provided piped water supply without sewerage system
   (iv)Air Ports and Sea Ports
5. Chlorine used in a Water Treatment Plant for treating 15,000 m^3 per day is 18 kg/day. The residual Chlorine observed after 30 minutest contact time is 0.2mg/L. Determine Chlorine dosage and Chlorine demand in mg/L.
6. What are the various factors to be considered for evaluating and selecting unit operations and processes for treatment of water?
7. What methods are commonly used for desalination of water?
8. Draw the water treatment flow sheet for the surface water which is highly polluted with algae and microorganisms.
9. What are the major causes of water quality degradations of our water resources?
10. Write a brief note on different types of valves used in water supply distribution systems.

PART - B (5 x 16 = 80 Marks)

11. (i) What is an intake structure? Enumerate the various types of intake structures and discuss in detail any two intake structures with the help of neat sketches. (8)

    (ii) Illustrate with sketches, the different types of layouts of pipe system in distributing water and compare their merits and demerits. (8)

12.a)(i) From a clear water reservoir 3m deep, water is pumped to an elevated reservoir at the constant rate of 9,00,000 L/h. The maximum water level at clear water reservoir and elevated reservoir will be +30.00 m & +75.00 m respectively. If the length of the rising main is 1500 m, determine the economical diameter of the rising main. Also determine BHP of the pump, assuming pump efficiency as 60%. Assume Darcy-Weisbach's friction factor as 0.04. (8)

(ii) Design a gravity transmission pipeline of MS pipe to carry a discharge of 65,000 lpm. Length of pipeline is 4,200 m. Available head difference between source and discharge level is 12 m. Assume residual pressure required at discharge end as 2 m. Assume Hazen-Williams coefficient (C) for the pipe material as 130. (8)

(or)

b)(i) What are 'infiltration galleries' and 'infiltration wells'? Explain both with neat sketches. (8)

(ii) During a recuperation test, the water level in an open well was depressed by pumping by 2.5 m and is recuperated by an amount of 1.6 m in 70 minutes.
a)Determine the yield from a well of 3m diameter under a depression head of 3.5m.
b)Also determine the diameter of the well to yield 10L/s under a depression head of 2.5m.(8)

13.a)(i) Design a Mechanical Rapid Mixing Unit (Flash Mixer) for a design flow of 250 m^3/hour. Assume water temperature to be 20°C and value $\mu = 1.002X10^{-3}$ Ns/m^2. (8)

(ii) Design a secondary circular settling tank to remove alum floc with following data. (8)

Average output from settling tank =	250 m^3/h
Amount of water lost in desludging=	2%
Minimum size of alum floc to be removed =	0.8mm
Specific gravity of alum floc =	1.002
Expected removal efficiency of alum floc =	80%
Kinematic viscosity of water at 20° C =	$1.003x10^{-6}$ m^2/s
Assumed performance of settling tank =	Very good (n=1/8)

(or)

b) Design a rapid sand filter to treat 10 million liters of raw water per day allowing 0.5% of filtered water for back washing. Half hour per day is used for backwashing. Assume necessary data for designing filer bed, under drainage system and washwater gutter. Assume Total area of perforations as 0.2% of total area of filter unit, spacing of laterals as 300 mm, and diameter of perforations as 13 mm. Assume rising washwater velocity in the filter bed as 0.5 m/min. and maximum clear distance between washwater troughs as 1.9 m.

14. a) Determine the balanced flows and headlosses in the water supply distribution network shown in fig.1 using Hardy-Cross Method (stop with two iterations). Hazen William's coefficient (C) for all pipes=100.

Pipe	Diameter (mm)	Length(m)
AB	450	600
BC	350	500
CD	220	650
AE	380	200
ED	280	1190

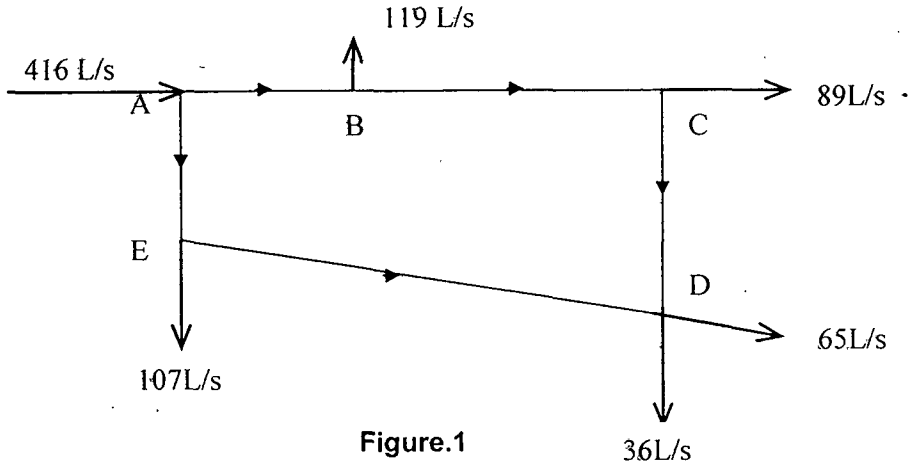

Figure.1

(or)

b) Find out the capacity of Service Reservoir when the power is available throughout 24 hrs. for 16 h of pumping during 4 am to 12 noon & 1 pm to 9 pm.

Data given are:

Design population	24,000
Percapita water supply	90 lpcd
Peak factor	2.25
Peak hours	6am to 10am 1pm to 2 pm 5pm to 6pm
Other than peak hours,the hourly demand are as follows.	
20% of average hourly demand	11 pm to 4 am
40% of average hourly demand	4 am to 5 am & 10 pm to 11 pm
60% of average hourly demand	12 noon to 1 pm
70% of average hourly demand	2 pm to 5 pm & 8 pm to 10 pm
80% of average hourly demand	5 am to 6 am
90% of average hourly demand	6 pm to 8 pm
100% of average hourly demand	10 am to 12 noon
Water supply is continuous .	

15.a)(i) Estimate quantity and quality of the waste stream and the total quantity of water that must be processed from a Reverse Osmosis (RO) facility that is to produce 4000 m^3/d of water to be used for industrial cooling operations. Assume that both recovery and rejection rates are equal to 90% and that the concentration of the feed stream is 400 g/m^3. (8)

(ii) Describe the reverse osmosis process. What pre - treatment is required before applying Reverse Osmosis process? (8)

(or)

b) Write Short notes on

(i) Ion Exchange resins for Water Softening

(ii) Water Treatment Technologies for Iron & Manganese Removal

(iii) Water Treatment Technologies for Fluoride Removal.