B. Tech.

(SEM. IV) EXAMINATION. 2006-07

WATER ENGINEERING

Time : 3 Hours] [Total Marks : 100

Note : (i) Attempt all questions.
(ii) All questions carry equal marks.
(iii) In case of numerical problems assume data wherever not provided.

1 Attempt any two parts of the following : 10×2=20

a) Enumerate the common pollutants affecting the quality of water supply. Describe their effects on human body.

b) A rectangular settling tank without mechanical equipment is to treat 2 million litres per day of raw water. The sedimentation period is to be 4 hours. The velocity of flow 8cm/minute and the depth of the water and sediment 4.2m. If an allowance of 1.2 m for sediment is made, what should be
i) The length of basin
ii) The width of the basin

C) Describe the various constituents of a coagulation – sedimentation plant with sketches.
Attempt any four parts of the following: \(5 \times 4 = 20\)

a) Discuss the construction and working of a rapid gravity filter.

b) Differentiate between temporary and permanent hardness of water.

c) Design six slow sand filter beds from the following data:
   Population to be served = 60,000 persons
   Per capita demand = 135 l/hr.
   Rate of infiltration = 175 l/hr/sq.m
   Length of each bed = Twice the breadth.
   Assume max” demand as 1.75 times of the average daily demand.
   Also assume that one unit out of six will be kept as standby.

d) Write the process of removal excess of fluorides from drinking water.

e) Differentiate between the following pairs.
   i) Loss of head and negative head in rapid sand filter
   ii) Aeration and screening

f) What is meant by “disinfection” in treating public water supply? What are the chemicals which are used as disinfectants?

Attempt any two parts of the following: \(10 \times 2 = 20\)

a) Describe briefly bringing out salient points on base exchange process and lime soda process in water softening.

b) Discuss the common methods of their treatment of water coming from oil refineries and dairies.

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c) Discuss in details stream pollution by industrial waste and its control. Also draw the flow sheet showing the different treatment units of water purification plants.

4 Attempt any two parts of the following: 10x2=20

a) What are the different sources of water supply? Explain with the help of a sketch the utility of a mass curve and demand curve for water supply.

b) Population of a town as obtained from the census report is as follows:

<table>
<thead>
<tr>
<th>Census Year</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>45520</td>
</tr>
<tr>
<td>1971</td>
<td>55460</td>
</tr>
<tr>
<td>1981</td>
<td>63710</td>
</tr>
<tr>
<td>1991</td>
<td>71320</td>
</tr>
<tr>
<td>2001</td>
<td>79540</td>
</tr>
</tbody>
</table>

Apply an approximate method, give reasons and predict population for the year 2011.

c) What do you mean per capita demand of water? How it can be calculated? Point out its importance for design of various units in water supply scheme.

5 Attempt any four parts of the following: 5x4=20

a) What is a “Booster pump”? Where it is used?

b) Draw schematic diagram of Ring system and radial system of lay out of distribution system.

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c) Calculate the diameter of cast iron pipe required for the distribution system of a part of the town with a population of 1000 persons. Make reasonable assumptions regarding the rate of supply, terminal pressure, etc.

d) Why is corrosion of great significance in connection with water supply mains? What means are employed to minimize it?

e) What factors will you keep in mind while designing plumbing system for water supply to a house?

f) A town is receiving its water supply from an impounding reservoir through 90 cm diameter gravity main with a fall of 79.2 m for distance of 80.5 km. Due to growth of population it is proposed to increase the supply by 50% laying a part length of additional 150 cm diameter pipe and new line being joined cross-connections. Find out the length of the new pipe line required. \( (4f = 0.04) \)