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06CV61

**Sixth Semester B.E. Degree Examination, June-July 2009**  
**Environmental Engineering – I**

Time: 3 hrs.

Max. Marks:100

- Note:1. Answer any FIVE full questions,**  
**selecting at least two questions from each part.**  
**2. Missing data may be suitably assumed.**

**Part A**

- 1 a. Discuss the impact of human activities on environment. (08 Marks)  
b. A city has following recorded population:
- |            |       |        |        |
|------------|-------|--------|--------|
| Year       | 1961  | 1981   | 2001   |
| Population | 50000 | 110000 | 160000 |
- Estimate: i) Saturation population ii) Equation of logistic curve and iii) Expected population in the year 2021. (12 Marks)
- 2 a. Discuss the factors governing the selection of source of water for water supply scheme. (06 Marks)  
b. Define intake structures. List the factors governing selection and location of intake. (06 Marks)  
c. From a clear water reservoir 2.5 m deep and maximum water level at 32.00 m, water is to be pumped to an elevated reservoir at 80.00 m at a constant rate of 810000 litre per hour. The distance is 1200 m. Give the economical diameter of the rising main and the water horse power of the pump. Neglect minor losses and take  $f=0.04$ . (08 Marks)
- 3 a. Give the desirable and permissible limits of following water quality parameters for drinking purpose as per BIS:  
i) Hardness ii) Sulphate iii) Nitrate. (06 Marks)  
b. What are indicator organisms? Give the criteria for selection of an indicator organism. (08 Marks)  
c. Explain the membrane filter technique used for microbiological analysis of water. (06 Marks)
- 4 a. Explain briefly the treatment of river water with a flow chart indicating the impurities removed at each unit. (06 Marks)  
b. Define aeration process. List the objectives of aeration. (06 Marks)  
c. A sedimentation tank is designed for an overflow rate of 4000 L/m<sup>2</sup>/h. What percentage of particles of diameter i) 0.05 mm and ii) 0.02 mm will be removed in this tank at 10°C. Assume kinematic viscosity of water at 10°C as 1.31 centistokes. (08 Marks)

**Part B**

- 5 a. Explain theory of filtration. (06 Marks)  
b. Explain with a neat sketch working and cleaning of rapid gravity filters. (08 Marks)  
c. A filter unit is of size 4m × 8m. After filtering 8000 m<sup>3</sup>/d in 24 hours period, the filter unit is backwashed at the rate of 10 L/m<sup>2</sup>/sec for 10 minutes. Compute  
i) The average filtration rate.  
ii) Quantity and percentage of treated water used in washing and  
iii) The rate of washwater flow in each trough. The unit has 4 troughs. Assume that filter is closed for 30 minute every day for back washing and cleaning. (06 Marks)

- 6 a. Define following terms with reference to chlorination of water:
- Free available chlorine.
  - Combined chlorine.
  - Residual chlorine.
  - Chlorine demand.
  - Break point chlorination. (10 Marks)
- b. Explain zeolite process of water softening writing the chemical reactions involved. Draw the neat sketch of zeolite water softener. (10 Marks)
- 7 a. Explain the use of activated carbon in water treatment. (08 Marks)
- b. A town with a population of 1 lakh is to be supplied with water at the rate of 200 litres/day/head. The variation in water demand is as follows:
- 6 am to 9 am – 40% of total
  - 9 am to 12 noon – 10% of total
  - 12 noon to 3 pm – 10% of total
  - 3 pm to 6 pm – 15% of total
  - 6 pm to 9 pm – 25% of total
- Determine the capacity of service reservoir assuming pumping to be at uniform rate and the period of pumping to be from 6 am to 6 pm. Solve the problem using mass curve method. (12 Marks)
- 8 Briefly explain any four of the following:
- Fire hydrant.
  - Water meter.
  - House water connection.
  - Defluoridation.
  - Dead-end system of distribution. (20 Marks)

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