

Code No: 126AA

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD****B.Tech III Year II Semester Examinations, May - 2016****ENVIRONMENTAL ENGINEERING****(Civil Engineering)****Time: 3 hours****Max. Marks: 75**

**Note:** This question paper contains two parts A and B. Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A****(25 Marks)**

- 1.a) What are the components of a water supply system? [2]
- b) List four factors affecting per capita water demand. [3]
- c) What is the purpose of coagulation? [2]
- d) List out four coagulants used in treatment of water. [3]
- e) How do you quantify Sewage? [2]
- f) What are the factors affecting the selection of materials for sewer construction? [3]
- g) Distinguish between unit operations and unit processes. [2]
- h) What are the objectives of grit removal? [3]
- i) What is the role of algae in aerobic pond? [2]
- j) What is the role of acetogenic bacteria in anaerobic digestion? [3]

**PART - B****(50 Marks)**

- 2.a) What is the importance of public water supply schemes in the present day life?
- b) Draw the flow diagram of a typical water supply scheme using an impounded reservoir as the source of water supply and show there the different works involved. [5+5]

**OR**

- 3.a) How the quantity of water required for a town is estimated while designing the water supply scheme for the same?
  - b) Given the following data, calculate the population at the end of next three decades by Decreasing rate method. [5+5]
- | Year       | 1980  | 1990   | 2000   | 2010   |
|------------|-------|--------|--------|--------|
| Population | 90000 | 140000 | 188000 | 328580 |

- 4.a) What is Disinfection? Explain the Break Point Chlorination.
- b) Design a set of rapid sand filters for treating water required for a population of 50000. The rate of supply being 180 lpcd. The filters are rated to work at 5000 liters/hour/sq.m. Assume any other suitable data required. [5+5]

**OR**

- 5.a) Compare the design and working features of the slow sand filter and rapid sand gravity filter.
- b) Design coagulation cum sedimentation tank for a population of 1 lakh persons with a water supply of 150 LPCD. Assume any other suitable data required, [5+5]

- 6.a) What do you mean by variation in flow of sewage? Explain average flow, dry weather flow, and maximum flow.
- b) A 30 cm dia sewer with an invert slope of 1 in 400 is flowing  $1/3^{\text{rd}}$  of the full depth. Calculate the velocity and the rate of flow in the sewer. Is it self-cleaning velocity? Use  $n=0.015$ . [5+5]

OR

- 7.a) Explain the importance of determination of solids in sewage. How do you determine the suspended solids in a given sample of waste?
- b) The 3 day  $37^{\circ}\text{C}$  BOD of a sample of sewage is 300 ppm. What will be its 10 days –  $20^{\circ}\text{C}$  BOD and 5 day  $30^{\circ}\text{C}$  BOD? [5+5]

- 8.a) What do you understand by secondary treatment (or biological treatment) of wastewater? Enumerate various treatment techniques used for biological treatment.
- b) A sedimentation tank treats 8 m<sup>3</sup>/d containing 240 mg/l of suspended solids. The tank removes 65% of the suspended solids. Compute the weight and volume of the sludge produced yearly if the moisture content is (i) 97% (ii) 94% [5+5]

OR

- 9.a) Differentiate between aerobic and anaerobic treatment of sewage, giving major end products. Name one treatment method in each category.
- b) Estimate the solids production from a trickling filter plant treating 1000 m<sup>3</sup>/day with a BODs of 200 mg/l and SS of 250 mg/l. Assume that primary clarification removes 30 percent of the BOD and 60 percent of the influent solids. [5+5]

- 10.a) What do you understand by 'digestion of sludge'? Differentiate between anaerobic and 'aerobic digestion'. Explain the mechanism of anaerobic digestion.
- b) Explain, with the help of a flow chart, various processes involved in sludge treatment and disposal. [5+5]

OR

- 11.a) Write a note on sludge conditioning. Why elutriation is necessary before chemical conditioning?
- b) Design an oxidation pond for treating sewage for a town of 20,000 persons. [5+5]  
Sewage flow = 200 lpcd  
BOD of raw sewage = 300 mg/l  
Organic loading rate = 300kg/hectare/day.  
Depth of pond = 1.2m

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