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CT-506/E.Engg./5th Sem/2016/N

## ENVIRONMENTAL ENGINEERING

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) Discuss briefly the necessity of replacing the conservancy system by the water carriage system of sanitation. 6
  
- (b) A population of 30,000 is residing in a town having an area of 60 hectares. If the average coefficient of runoff for this area is 0.60 and the time of concentration of the design rain is 30 minutes, calculate the discharge for which the sewer of a proposed combined system will be designed for the town. Assume

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the rate of supply as 120 litres/person /day. Also assume 80% of this water supply will reach the sewer as sanitary sewage. 8

2. (a) What is the necessity of treatment of water for drinking purposes ? Enumerate the various treatment methods for making water fit for drinking. 10

(b) Calculate the diameter and discharge of the circular sewer laid at a slope of 1 in 400 when it is running half full and with a velocity of 1.9 m/sec. Assume Manning's constant as 0.012. 4

3. (a) Write short notes on the following :  $2 \times 5 = 10$

(i) pH value of water.

(ii) Hardness of water.

(b) Find the setting velocity of discrete particles in water under condition when Reynold's number is less than 0.5. The diameter and specific gravity of the particle is  $5 \times 10^{-3}$  cm and 2.65 respectively. Water temperature is  $20^\circ\text{C}$ . 4

4. Describe the procedure for laying and testing of sewers. 14
5. (a) Water has to be supplied to a town with 1 lakh population at the rate of 150 litres / capita / day from a river 2000m away. The difference in elevation between the lowest water level in the sump and the reservoir is 36m. If the demand has to be supplied for 8 hours, determine the size of the mains and the brake horse power of the pump required. Assume  $f = 0.0075$ . Velocity in the MPC 2.4 m/sec and efficiency of pump 80%. 10
- (b) Explain the significance of turbidity from the point of view of water quality criteria. 4
6. (a) Enumerate the chemicals which are used for coagulation. Discuss their comparative merits and demerits. 7
- (b) Differentiate between rapid sand filter and slow sand filter. 7
7. (a) How will you estimate the quantity of water to be stored in the distribution system. 6

- (b) Design Rapid sand filter units for a population of 1,00,000 to be served by a 200 litres / capita / day water supply. Assume the following :

Rate of filtration =  $3 \times 10^5$  m<sup>3</sup>/ha/day.

Amount of wash water = 5% of filtered water per day.

The filter needs back washing once in 24 hrs. 8