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Reg No.: \_\_\_\_\_

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S8 (S, FE) / S6 (PT) (S, FE) Examination January 2024 (2015 Scheme)

Course Code: CE402

Course Name: ENVIRONMENTAL ENGINEERING – II

Max. Marks: 100

Duration: 3 Hours

## PART A

*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) What is time of concentration? Appraise its significance and method of determination. (6)
- b) A 40 cm sewer having invert slope of 1 in 200 was running full. What would be the velocity of flow and discharge, if  $N = 0.015$ ? (6)
- c) Differentiate between dry weather flow and storm water flow. (3)
- 2 a) Discuss relative merits of separate and combined system of sewerage, and give conditions favourable for the adoption of each one of them. (6)
- b) The 5 day  $30^\circ\text{C}$  BOD of sewage sample is 120 mg/L. Calculate its 5 days  $20^\circ\text{C}$  BOD. Assume the de-oxygenation constant at  $20^\circ\text{C}$ ,  $K_{20}$  as 0.11. (9)
- 3 a) Draw a neat sketch of a sewage ventilator. What is the necessity of ventilation of sewers? (6)
- b) The drainage area of one sector of a town is 20 hectares. The classification of the surface of this area is as follows: (9)

Percentage of total surface area (%)	Type of surface	Runoff coefficient
25	Hard pavement	0.85
25	Roof surface	0.80
15	Unpaved street	0.30
25	Gardens and lawns	0.15
10	Wooded area	0.10

If the time of concentration for the area is 30 minutes, find the maximum runoff.

Use the following formula for intensity of rainfall:

$$R_i = \frac{900}{t + 60}$$

**PART B**

*Answer any two full questions, each carries 15 marks.*

- 4 a) Write short notes on (9)
- (i) Oxygen sag curve
  - (ii) Sewage sickness
  - (iii) Self-purification of streams
- b) Design a circular sedimentation tank unit for a primary treatment of sewage at 15 million litres per day. Consider detention period as 2 hours and surface loading as 40,000 litres/m<sup>2</sup>/day. (6)
- 5 a) Write short note on activated sludge process. (5)
- b) Design suitable dimensions of a circular trickling filter unit for treating 5 million litres of sewage per day. The BOD of sewage is 120 mg/L. (10)
- 6 a) What is the necessity of maintaining constant velocity in grit chamber? (5)
- b) Distinguish between conventional and high rate trickling filter. (5)
- c) Describe a rotating biological contactor. (5)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) Design an Imhoff tank to treat the sewage from a small town with 30,000 population, assuming that the suspended solids in the influent sewage are 200 ppm. Water content of sludge is 97 per cent. Design the tank for three months sludge storage. Rate of sewage is 135 Litres per head per day. (15)
- b) Differentiate between oxidation ditch and oxidation pond. (5)
- 8 a) What do you mean by sludge thickening? Discuss on the methods of sludge thickening. (10)
- b) Calculate the area of land required for drying the sludge from the digestion tank for 50,000 population, Also design the dimensions of beds. The dry sludge content per capita per day is 0.068kg. The moisture of the sludge is 95%. The specific gravity of wet sludge is 1.02. (10)
- 9 a) Design a septic tank for the following data: (10)
- No. of people = 100
  - Sewage/capita/day = 120 Litres
  - De-sludging period = 1 year
  - Length: width = 4:1
- b) Discuss the effect of pH and temperature on sludge digestion. (6)
- c) Write a note on sludge conditioning. (4)

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