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53 (CE 602) ENEN-II

2021

ENVIRONMENTAL ENGG.-II

Paper : CE 602

Full Marks : 100

Time : Three hours

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

Answer **any five** questions out of **six**.

1. Explain in order, the various stages followed in the construction of a sewerage system. 20
2. (a) Define the following: 2×4=8
 - (i) Sanitation
 - (ii) Domestic sewage
 - (iii) Industrial wastewater
 - (iv) Sanitary sewage.

Contd.

- (b) The drainage area of one sector of a town is 15 hectares. The classification of the surface of this area is as follows :

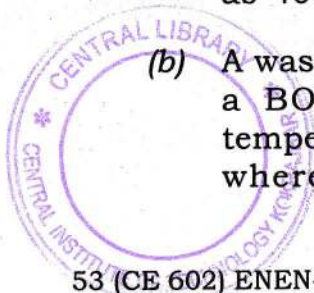
% of total surface area	Type of surface	Co-efficient of runoff
20%	Hard Pavement	0.85
20%	Roof Surface	0.80
20%	Unpaved street	0.20
30%	Garden	0.20
10%	Wooden area	0.15

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

$$R = \frac{900}{t + 60} \quad 12$$

3. (a) Design a circular settling tank unit for a primary treatment of sewage at 12 million litres per day. Assume detention period as 2.5 hrs. and surface loading as 40000 litres/m²/day. 8

- (b) A wastewater effluent of 560 l/sec with a BOD=50mg/L, DO=30mg/L and temperature of 23°C enters a river where the flow is 28m³/sec and



BOD=4.0mg/L, DO=8.2mg/L and temperature of 17°C. K_D of the waste is 0.10 per day at 20°C. The velocity of water in the river downstream is 0.18m/s and depth of 1.2m. Determine the following after mixing of wastewater with the river water : 8

- (i) Combined discharge
- (ii) BOD
- (iii) DO
- (iv) Temperature

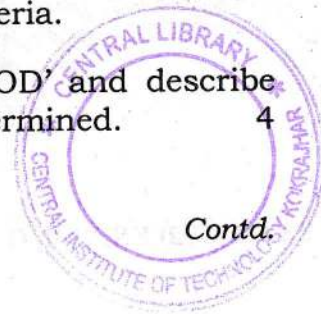
(c) Explain briefly the zone of pollution in a river stream. 4

4. (a) 5 day 20°C BOD of an industrial waste is 200mg/L. Calculate 1 day 37°C BOD of that waste. Assume K_D at 20°C as 0.15. 5

(b) Distinguish clearly between the following bacteria : 6

- (i) Aerobic bacteria
- (ii) Anaerobic bacteria
- (iii) Facultative bacteria.

(c) Explain the term 'BOD' and describe briefly how it is determined. 4



- (d) Explain the following terms :
- (i) Population Equivalent
 - (ii) Nitrogen cycle in the decomposition of sewage. 5
5. (a) Determine the size of a circular sewer for a discharge of 600 litres per second running half full.
Assume bed slope = 0.0001
and $n=0.015$ 6
- (b) Write short notes on : 8
- (i) Testing of new sewers
 - (ii) Sewer types.
- (c) Draw a neat sketch of a drop manhole and indicate where it is used. 6
6. Design an Imhoff tank to treat the sewage from a small town with 40000 population. The rate of sewage may be assumed as 150 litres per head per day. Assume the necessary data. 20

