*Total number of printed pages–4*

**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

$$R = \frac{900}{t+60}$$ 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=50*mg/L*, DO=30*mg/L* and temperature of 23°*C* enters a river where the flow is 28$m^3$/*sec* and

BOD=4·0$mg/L$, DO=8·2$mg/L$ 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 0·18$m/s$ and depth of 1·2$m$. 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 200$mg/L$. 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