**53 (CE 602) ENEN-II**

## 2018

### 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.  (a)  Define conservancy and water carriage
        system. Also compare both the systems.
        Describe in brief classification of water
        carriage system.                    2+4+4

    (b)  Mention the constituents and
        interrelated aspects of wastewater
        management. Describe the performance
        criterias of wastewater management.

        5+5

2. *(a)* An impervious area of 20 hectares is to be served by a sewer line. This area is subject to three storms $P_1$, $P_2$ and $P_3$ with equal frequency of occurance. The duration of the three storms is 20 minutes, 30 minutes and 35 minutes respectively. Taking the time of concentration equal to 30 minutes, determine the maximum runoff from each storm. 14

*(b)* A sewer has a catchment area of 50 hectares. Estimate the storm water flow corresponding to a rainfall of 40$mm$ during a time of concentration of 30 minutes. Assume that the impervious area is equal to 55% of the total catchment area use Lloyed Davis formula. 6

3. *(a)* Mention and describe different types of sewers in brief. What are the important factors those are to be considered before selecting a particular sewer material? What are the advantages and disadvantages of a cement concrete sewer? 4+4+2

*(b)* With the help of neat skematic diagrams describe the different types of sewer joints. 10

4. *(a)* Discuss in detail, the different types of characteristics of wastewater. Mention each type and discuss all the subtypes present in them.　　　　　15

   *(b)* For a wastewater sample, 5 day BOD at $20°C$ is $200 mg/l$ and is 67% of the ultimate. What will be the 4 day BOD at $30°C$.　　　　　5

5. *(a)* Describe the different types and subtypes for wastewater disposal method. Discuss oxygen sag analysis with the help of "oxygen say and BOD removal curve".　　　　　$3+7$

   *(b)* A stream, saturated with DO, has a flow of $1·2 m^3/s$, BOD of $4 mg/l$ and rate constant of $0·3$ per day. It receives an effluent discharge of $0·25 m^3/s$ having BOD $20 mg/l$, DO $5 mg/l$ and rate constant $0·13$ per day. The average velocity of flow of the stream is $0·18 m/s$. Calculate the DO deficit at point $20 km$ and $40 km$ downstream. Assume that the temperature is $20°C$ throughout and BOD is measured at 5 days. Take saturation DO at $20°C$ as $9·17 mg/L$　　　　　10

6. (a) Design a primary settling tank of rectangular shape for a town having a population of 50,000, with a water supply of 180 litres per capita per day.   10

(b) The sewage flows from a primary settling tank to a standard rate trickling filter at a rate of 5 million litres per day having a 5 day BOD of $150mg/l$. Determine the depth and the volume of the filter, adopting a surface loading of $2500l/m^2/day$ and an organic loading of $165g/m^3/day$. Also determine the efficiency of the filter unit, using NRC formula.   10