2025
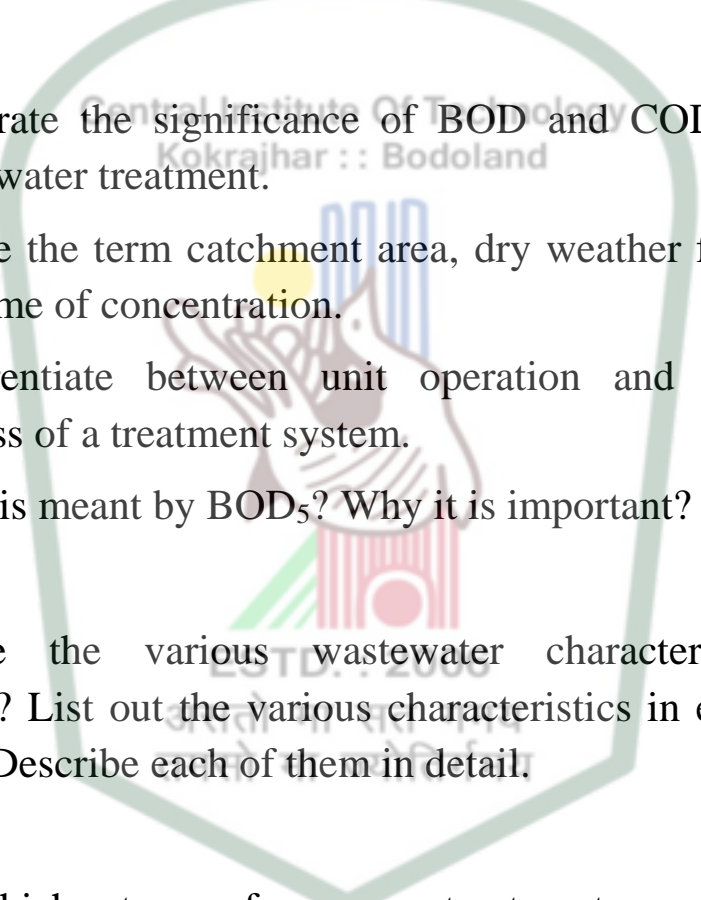**Environmental Engineering-II**
Full Marks : 100

Time : Three hours

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

*Answer **any five** questions.*

1. a) Elaborate the significance of BOD and COD in wastewater treatment. $2.5 \times 2 = 5$

   b) Define the term catchment area, dry weather flow and time of concentration. $2+2+2 = 6$

   c) Differentiate between unit operation and unit process of a treatment system. $2.5 \times 2 = 5$

   d) What is meant by BOD_5? Why it is important? $2+2 = 4$

2. What are the various wastewater characteristic categories? List out the various characteristics in each category. Describe each of them in detail. $3+6+11=20$

3. a) At which stage of sewage treatment process, sludge is produced? Describe the sludge formation process. $2+3=5$

   b) List out various laboratory tests to analyse the properties of wastewater. 6

   c) For WCS, write the methodology for combined WCS, separate WCS and partially combined WCS $3+3+3=9$

in a comparative manner.

4. a) 2 MLD of water is passing through a sedimentation tank which is 6 m wide, 15 m long & 3 m deep. Find (i) Detention time, (ii) Avg. flow velocity & (iii) Settling velocity.　　　2+2+2=6

   b) The maximum daily demand at a water treatment plant is estimated as 12 MLD. Design the dimensions of a suitable sedimentation tank assuming detention period of 6 hours and velocity of flow as 20 cm/min. Assume height of the tank as 4m.　　　8

   c) The 5day BOD (BOD_5) of a wastewater sample is 140 mg/L (k=0.26/day). What will be the oxygen demand of organic matter left after 6 days?　　　6

5. a) What are the various types of sewerage systems? Explain each of them briefly.　　　6

   b) A sewer has a catchment area of 70 hectares. Estimate the storm water flow corresponding to a rainfall of 4 cm during a time of concentration of 0.5 hours. Assuming the impervious area is equal to 50% of the total catchment area. Use Lloyed Davis formula.　　　4

   c) What are the various stages/operations/processes of a typical wastewater treatment system? Describe each of them with the help of a schematic diagram.　　　10

6. a) Determine the ultimate BOD for a sewage having 5 day BOD at 20 °C as 160 ppm. Assume the de-oxygenation constant as 0.12 per day. Also　　　6

determine the 2 day BOD for the Sewage for the above case.

b) Describe the 1st stage BOD curve with the help of a neat schematic diagram.   8

c) Define BOD, COD, TOD and ThOD   1.5×4 = 6