

- (b) A 20 cm diameter sewer is laid at a slope of 0.004 and is designed to carry a discharge at a depth of 10 cm with Manning's  $n = 0.014$ .  
What will be the design discharge ? 5

6. Describe one pipe, two pipe and single stack system of plumbing for buildings, and state their merits and demerits. Which one of these would you recommend for the toilet blocks of students hostel in the campus and why ? 10

#### Section D

7. What is De-oxygenation, Re-oxygenation and oxygen deficit curve ? How are they related to each other ? 10
8. Enumerate the two general methods adopted for sewage disposal and discuss their merits and demerits explaining the conditions favorable for their adoption. 10

#### (Compulsory Question)

9. (i) What is BOD and COD ?  
(ii) What is MLSS ?

**July-22-00348**

**B. Tech. EXAMINATION, 2022**

Semester VI

CIVIL ENGINEERING

CE-603

Environmental Engineering-II

Time : 3 Hours

Maximum Marks : 60

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*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

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**Note :** Attempt *Five* questions in all, selecting *one* question from each Sections A, B, C and D. Q. No. 9 is compulsory.

#### Section A

1. (a) The 5 day 30°C BOD of sewage sample is 130 mg/l. Calculate its 5 days 20°C BOD. Assume the deoxygenating constant at 20°C,  $K_{20}$  as 0.13. 5

(b) What is the difference between separate and combined system of wastewater collection ? 5

2. (a) The following observations were made on a 3% dilution of waste water :

(i) Dissolved Oxygen (D.O.) of aerated water used for dilution = 4 mg/l

(ii) Dissolved Oxygen (D.O.) of diluted sample after 5 days incubation = 0.9 mg/l

(iii) Dissolved Oxygen (D.O.) of original sample = 0.7 mg/l.

Calculate the BOD of 5 days and ultimate BOD of the sample assuming that the deoxygenation coefficient at test temp is 0.13. 5

(b) Write a short note on the construction and maintenance of sewer, bringing out the salient features. 5

### Section B

3. Determine the size (area and diameter) of a high rate trickling filter for the following data. Calculate the size of the conventional trickling filter to accomplish the above requirement :

Flow	5 MLD
Recirculation ratio	1.3
BOD of raw sewage	270 mg/l
BOD removed in primary clarifier	30%
Final effluent BOD desired	50 mg/l 10

4. What is the difference between attached growth and activated growth system ? Explain the working of both the processes with example. 10

### Section C

5. (a) A 350 mm diameter sewer is to flow at 0.35 depth on a grade ensuring a degree of self-cleansing equivalent to that obtained at full depth at a velocity of 0.8 m/sec.

Manning's coefficient = 0.013

Proportionate area = 0.315

Proportionate wetted perimeter = 0.472

Proportionate HMD ( $r/R$ ) = 0.07705

Find :

(i) The required grade

(ii) Associated velocity

(iii) The rate of discharge at this depth. 5

- (iii) What is Sludge age ? Explain with the help of a flow chart diagram.
  - (iv) Difference between industrial waste and domestic waste.
  - (v) What is proportionate area ? Derive the formula.
  - (vi) What is total, suspended and volatile solids ?
  - (vii) What is DO ?
  - (viii) What is difference between manhole and drop hole ?
  - (ix) Why a constant velocity has to be maintained in a grit chamber ?
  - (x) What is the difference between *q*, *p* and *s* type traps ?
- 10×2=20**