

**B. TECH**  
**(SEM VI) THEORY EXAMINATION 2022-23**  
**ENVIRONMENTAL ENGINEERING**

Time: 3 Hours

Total Marks: 100

**Note:** Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt all questions in brief. 2 x 10 = 20**

- (a) What is a spigot and socket joint?
- (b) Define reflux and relief valves.
- (c) What is coincident draft?
- (d) Write Hazen Williams formula with usual notations.
- (e) What is Theoretical Oxygen demand?
- (f) How will you measure turbidity of river water?
- (g) What are various forms of chlorine?
- (h) Write various forms of nitrogen present in sewage water.
- (i) What is the role of algae in aerobic pond?
- (j) Differentiate between attached growth and suspended growth system.

**SECTION B**

**2. Attempt any three of the following: 10x3=30**

- (a) Discuss various factors that affect the water demand.
- (b) Differentiate between storage and service reservoirs. Explain unit operations.
- (c) (i) A sample of wastewater has an ultimate BOD of 280 mg/L and a 5-day BOD at 20°C of 240 mg/L. Calculate 20-day BOD at 20°C of this sample.  
(ii) A BOD<sub>5</sub> of waste water is determined to be 150 mg/l at 20°C. The k value is known to be 0.23 per day. What would be the BOD<sub>8</sub> if the test were run at 15°C.
- (d) Discuss advantage and disadvantage of soda lime process and ion exchange methods of water softening.
- (e) Design a conventional grit chamber unit for a design sewage flow of 120MLD. Assume suitable-data wherever necessary. Draw a schematic diagram of the unit.

**SECTION C**

**3. Attempt any one part of the following: 10x1=10**

- (a) Over the two periods, each of 20 years population of a town increased from 30000 to 170000 to 300000. Find (i) Saturation population, (ii) Coefficients of logistic equation, and (iii) Expected population in next 20 years.
- (b) What are gravity and pressure conduits? Why pressure conduits are most commonly used for conveying water from distant sources to the town for supply?

4. Attempt any *one* part of the following: 10x1=10

- (a) What are various methods of layout of distribution system? Explain any two and their advantages.
- (b) Write a note on distribution reservoirs. Where are these located? How do you determine the storage capacity of balancing reservoir by mass curve method for 24 hours pumping?

5. Attempt any *one* part of the following: 10x1=10

- (a) What is carbonaceous BOD? How the probable interference of Nitrogenous oxygen demand is inhibited during BOD measurement?
- (b) Determine the most probable number of coliforms. A standard multiple fermentation test is run on a sample of water from a surface stream. The results of analysis for the confirmed test are shown below:

Size of samples (ml)	No. of positives
10	4
1	2
0.1	1
0.01	0

**Table:** MPN index for various combination of positive results when 5 test tubes are used per dilution (10ml, 1 ml, 0.1 ml)

Combination of positives	MPN index/100 ml
2-1-0	9
4-2-1	32

6. Attempt any *one* part of the following: 10x1=10

- (a) What are the minor and major methods of disinfection? Explain break point chlorination.
- (b) Design a plain sedimentation tank for an average flow of water 250m<sup>3</sup>/hr. The minimum size of particle to be removed 0.02 mm and expected performance of tank may be taken as 'good'. Kinematic viscosity of water at 20° C = 1.01 × 10<sup>-6</sup> m<sup>2</sup>/s and specific gravity of particle = 2.65.

7. Attempt any *one* part of the following: 10x1=10

- (a) What is sludge digestion? What are two basic types of sludge digestion units? Also name and describe methods of sludge disposal.
- (b) Explain the working of UASB reactor.