

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2455

Roll No.

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B.Tech.

(SEM. VI) EVEN THEORY EXAMINATION 2012-13

ENVIRONMENTAL ENGINEERING-II

Time : 3 Hours

Total Marks : 100

Note :— Attempt all questions. All questions carry equal marks.

Assume any missing data suitably.

1. Attempt any **four** of the following : (4×5=20)
- What is turbidity ? How is it measured and expressed ?
What is 1 NTU ?
 - What is an indicator organism ? Discuss the characteristics of the ideal pathogen indicator and indicate which organisms most nearly exhibit these characteristics.
 - What is carbonaceous BOD ? How the probable interference of Nitrogenous oxygen demand is inhibited during BOD measurement ?
 - During a MPN test, a set of three test tubes were used with sample of 1 ml in each, out of which tube two test tubes were positive. Estimate the MPN.
 - The 5-day 20°C BOD of a wastewater is 210 mg/l. What will be the ultimate BOD ? What will be the 10 day demand ? If the bottle had been incubated at 30°C, what would the 5 day BOD have been ? $K = 0.23 \text{ day}^{-1}$

(f) How BOD is measured ? Discuss the difference between modified Wrinkler's azide method and azide method of DO measurement in laboratory.

2. Attempt any **two** of the following : **(2×10=20)**

(a) Design a plain sedimentation tank for an average flow of water 250 m³/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^{-6} m²/s and specific gravity of particle = 2.65.

(b) Design a clariflocculator for an average flow of water 250 m³/hr. Assume any data suitably if required.

(c) Design a rapid sand filter for producing a net filtered water flow of 250 m³/hr. The other relevant data are as follows :

Quantity of backwash water used = 3% of filter output

Time lost during backwashing = 30 min

Design rate of filtration = 5 m³/m²/hr

Length to width ratio = (1.25 to 1.33): 1

Under drainage system = Central manifold

Size of perforations = 9 mm.

3. Attempt any **four** of the following : **(4×5=20)**

(a) What are cracking of filter bed and formation of mud balls during operation of rapid sand filter ?

(b) Write down Carmen-Kozeny's equation for head loss in stratified filter bed explaining each term.

(c) Explain break point chlorination. Also define super chlorination and pre chlorination.

(d) Write down Chic's law. Explain the effect of concentration and time on efficiency of disinfectant.

(e) What is adsorption ? Explain term 'activated' associated with Activated Carbon.

(f) Discuss advantage and disadvantage of soda lime process and ion exchange methods of water softening.

4. Attempt any **two** of the following : **(2×10=20)**

(a) Define biomass, lag phase, log growth phase, stationary phase, endogenous phase, suspended cultures, attached cultures, flocs.

(b) A completely mixed activated sludge process is to treat 10,000 m³/d of industrial wastewater. The wastewater has BOD₅ of 1200 mg/l that must be reduced to 120 mg/l prior to discharge to a municipal sewer. Pilot plant analysis indicates that a mean cell residence time of 5d maintaining MLSS concentration of 5000 mg/l produces desired results. The value for Y is determined to be 0.7 kg/kg and the value of k_d is found to be 0.03d⁻¹. Determine the volume of reactor, the mass and volume of solids wasted each day, the sludge recirculation ratio.

(c) Discuss system biology involved in ponds and lagoon. Also describe aerobic lagoon, anaerobic lagoon, facultative lagoon, polishing ponds.

5. Attempt any **two** of the following : **(2×10=20)**

(a) What is sludge digestion ? What are two basic types of sludge digestion units ? Also name and describe any methods of sludge disposal.

(b) Describe working of a USABR unit.

(c) Write short notes on duckweed pond, vermiculture and root zone technologies.