B.E. Civil Engineering (Model Curriculum) Semester-VIII
PEC-2-CE803 : Design of water and Waste Water Treatment

P. Pages : 2

Time : Three Hours

Max. Marks : 80

2592

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Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Design a cascade aerator of discharge 31000000 lit/day with net sketch. **8**

b) Explain slat tray aerator and gravel bed aerator with diagram. **8**

OR

2. a) In an experiment on the removal of carbon dioxide from water sprayed into the air in spherical droplets 5 mm in dia., the initial supersaturation of the water with CO_2 was 25.8 mg/l. After 1.2 seconds of exposure, this was reduced to 11.2 mg/l. Find the coefficient of gas transfer. **8**

b) Explain ion transfer by means of chemical coagulation, chemical precipitation, ion exchange, adsorption. **8**

3. a) Explain wet feeding by conical plug and adjustable weir with neat diagram. Also explain dry feeding by toothed wheel and helical screw. **8**

b) Write note on analysis of discrete settling. **8**

OR

4. a) A coagulation treatment plant with a flow of $0.5 \ m^3/sec$ is dosing alum at 23 mg/L. No other chemicals are being added. The raw water suspended solids concentration is 37 mg/L. The effluent suspended solids concentration is, measured as 12 mg/L. The sludge content is 1 percent and the specific gravity of sludge solids is 3.01. What volume of sludge must be disposed of each day? Based on your result, remark with reference to water treatment process. **8**

b) In order to treat 36 million litres per day of water, design the water depth for a mixing basin having around the end baffles.. Assume suitable values of detention period and the flow velocity through the basin. The tank, may be divided into two similar compartments by providing a longitudinal partition wall, and each half may have a clear width of 7 m. The clear distance between baffles may be kept as equal to min, permissible. Mention the number of channels in the tank and also the overall inside length of the tank. **8**

5. a) Explain formation of hypochlorous acid when water reacts with chlorine with reactions. Write down various reaction that forms chloramines. **8**

	b)	Explain Construction and working of pressure filter. Write down its operation rate of filtration, efficiency, advantages and disadvantages.	**8**

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OR

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6. a) A surface water treatment plant coagulates a raw water having a turbidity of 9 Jackson candle units by applying an alum dosage of 30 mg/l. Estimate the total sludge solids produced in grams per cubic metre of water processed. Compute the volume of sludge from the settling basin and filter backwash water using 1.0% solid concentration in the sludge and 500 mg /1 of solids in the wash-water. Assume that 30% of the total solids are removed in the filter. Use the following equation.
Sludge solids (mg/l) = Alum dosage/4 + raw water turbidity in Jtu. **8**

    b) Explain kinerics on chemical disinfection with its assume the ideal condition and variable affecting disinfection. **8**

7. a) Design a grit chamber for a maximum wastewater Mow of 8000 m^3 / day, to remove particles upto of 0.2 mm dia. having specific gravity of 2.65. The settling velocities of these particles is found to range from 0.018 to 0.022 m/sec Maintain a constant flow through velocity of 0.3 m/sec through the provision of a proportional flow weir. **8**

    b) Explain aerated grid chamber with help of diagram. Give it's depth, length, width, detention time. **8**

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OR

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8. a) Explain with neat sketch comminutor with rotating screen cutter. **8**

    b) State and explain secondary treatment methods of wastewater as defined by U.S. Environmental Protection Agency. **8**

9. a) Design a continuous flow completely-mixed activated sludge process to yield an effluent BODs of 20 mg/l and suspended solids of 23 mg/l. The influent BODs following primary clarification is 200 mg/l. The waste flow is 0.2 m/sec . Take Y = 0.65, kd = 0.05, Oc 10 days, MLVSS = 3000 mg/l, return-sludge concentration as 15000 mg/l of suspended solids (SS) and MLVSS ratio = 0.8. **8**

    b) Design a single stage Bio-filter to produce an effluent having max. BOD concentration of 50 mg/l, for a flow of sewage of 4 million litres per day containing BOD of raw sewage of 320 mg/l. Make suitable assumptions. **8**

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10. a) The sewage flows from a primary settling tank to a standard rate trickling Filter at a rate of 5 million liters per day having a 5-day BOD of 150 mg/l. Determine the depth and the volume of the filter, adopting a surface loading of 2500 l/m²/day and an organic loading of 165 g/m³/day. Also, determine the efficiency of the filter unit, using NRC. **8**

    b) Explain rotating disc biological contractor with neat sketch. **8**

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