CBCS SCHEME

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BCV304

Third Semester B.E/B.Tech. Degree Examination, June/July 2025
Water Supply and Waste Water Engineering

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Missing data, if any, may be suitably assumed.

		Module – 1	M	L	C
1	a.	What is meant by per capita demand? What are the different types of water demand? Explain any two water demand in detail.	6	L2	CO1
	b.	The population data for a certain town is given below. Find out the population in the year 2011 and 2021 by incremental increase method.	10	L3	CO1
	c.	Write drinking water standards along with the units for the following parameters : i) pH ii) Turbidity iii) Chloride iv) Iron.	4	L2	CO1
		OR			
2	a.	What is design period? Briefly explain any four factors governing design period.	6	L2	CO1
	b.	In two periods of each of 20 years, a city has grown from 30,000 to 1,70,000 and then to 3,00,000. Determine : i) The saturation population ii) The equation of the logistic curve iii) The expected population after next 20 years.	10	L3	CO1
	c.	List the physical and chemical water quality parameters.	4	L1	CO2
		Module – 2			
3	a.	What is Aeration? List the different types of aerators and explain any one aerator in detail.	4	L1	CO3
	b.	The maximum daily demand at a water purification plant has been estimated as 12 million liters per day. Design the dimensions of a suitable sedimentation tank (fitted with mechanical sludge removal arrangements) for the raw supplies, assuming a detention period of 6 hours and the velocity of flow as 20 cm per minute. Assume water depth in the tank as 4 m.	10	L3	CO3
	c.	How is coagulation carried out with alum? Explain with the help of chemical reaction.	6	L2	CO3

Year	1961	1971	1981	1991	2001
Population	75,000	1,10,000	1,50,000	2,00,000	2,42,000

		OR			
4	a.	With the help of a neat sketch, explain briefly on filter backwashing process of rapid sand filter.	**10**	**L2**	**CO3**
	b.	Design the approximate dimensions of a set of rapid gravity filters for treating water required for a population of 50,000, the rate of supply being 180 liters per day per person. The filters are rated to work 5000 liters per hour per square meter. Assume two units to be designed and maximum demand is 1.8 time the average daily demand. Take length as 1.5 times the breadth.	**10**	**L3**	**CO3**
		Module – 3			
5	a.	List minor methods of disinfection and explain any two methods in detail.	**6**	**L1**	**CO3**
	b.	Describe types of sewerage system with their advantages and disadvantages.	**6**	**L2**	**CO4**
	c.	The BOD of a sewage incubated for one day at 30°C has been found to be 110 mg/ℓ. What will be the 5-day 20°C BOD? Assume $K_1 = 0.1$ at 20°C.	**8**	**L3**	**CO4**
		OR			
6	a.	With the chemical equations, explain how hardness is reduced from water by lime-soda process.	**8**	**L2**	**CO3**
	b.	The following observations were made on a 3% dilution of wastewater. Dissolved Oxygen (DO) of aerated water used for dilution = 3 mg/ℓ Dissolved Oxygen (DO) of diluted sample after 5 days incubation = 0.8 mg/ℓ Dissolved Oxygen (DO) of original sample = 0.6 mg/ℓ Calculate the BOD of 5 days and ultimate BOD of the sample assuming that the deoxygenating coefficient at test temperature is 0.1.	**12**	**L3**	**CO4**
		Module – 4			
7	a.	Write the flow diagram employed for municipal wastewater treatment plant. Explain each unit with its importance in flow diagram.	**8**	**L2**	**CO4**
	b.	An average operating data for conventional activated sludge treatment plant is as follows : i) Wastewater flow = 35,000 m^3/d ii) Volume of aeration tank = 10900 m^3 iii) Influent BOD = 250 mg/ℓ iv) Effluent BOD = 20 mg/ℓ v) Mixed liquor suspended solids (MLSS) = 2500 mg/ℓ vi) Effluent suspended solids = 30 mg/ℓ vii) Waste sludge suspended solids = 9700 mg/ℓ viii) Quantity of waste sludge = 220 m^3/d Based on the information above, determine : i) Aeration period (hours) ii) Food to microorganism ratio (F/m) (kg BOD per day / kg MLSS) iii) Percentage efficiency of BOD removal iv) Sludge age (days).	**12**	**L3**	**CO4**

		OR			
8	a.	What do you mean by unit operation and unit process in waste water treatment plant? Give examples.	**6**	**L1**	**CO4**
	b.	Explain the different types of screens.	**6**	**L2**	**CO4**
	c.	With the neat sketch, explain how oil and grease is removed from wastewater.	**8**	**L2**	**CO4**
		Module – 5			
9	a.	Determine the size of a high rate trickling filter for the following data : Sewage flow = 5 MLD Recirculation ratio = 1.5 BOD of raw sewage = 230 mg/ℓ BOD removal in primary clarifier = 30% Final effluent BOD desired = 25 mg/ℓ Depth of the filter = 1.8 m.	**10**	**L3**	**CO4**
	b.	With the neat sketch, explain the algae bacteria symbiosis in stabilization pond.	**6**	**L2**	**CO5**
	c.	Write a short note on Rotating Biological Contractor (RBC).	**4**	**L1**	**CO4**
		OR			
10	a.	A single stage filter is to treat a flow of 3.79 MLD of raw sewage with BOD of 240 mg/ℓ. It is to be designed or a loading of 11,086 kg of BOD in raw sewage per hector meter and the recirculation ratio is to be 1. What will be the strength of the effluent, according to the recommendation of the national research council of USA?	**10**	**L3**	**CO4**
	b.	Write a neat sketch, explain the constructional details of sludge digestion tank.	**6**	**L2**	**CO4**
	c.	Write short notes on sludge drying beds.	**4**	**L1**	**CO5**

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