Q. Code:198999

Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fourth Semester

CE22402 – WATER SUPPLY AND WASTEWATER ENGINEERING

(Civil Engineering)

(Regulation 2022)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Describe the various sources and characteristics of water and determine the sizes of intake structure and conveyance system for water transmission.	**3**
CO 2	Describe the various unit operation and process of water treatment and compute the sizes of the water treatment units.	**3**
CO 3	Determine the capacity of service reservoir, analyse the water distribution networks and describe the maintenance of distribution systems, pumping stations and house service connections.	**3**
CO 4	Estimate sewage flow and storm runoff, describe the characteristics and composition of sewage and compute the sizes of sewerage system components.	**3**
CO 5	Compute the sizes of the treatment units and explain the unit operations and processes that are involved in the treatment of sewage and sludge.	**3**

PART- A (20 x 2 = 40 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Show the objectives of water supply system.	**1**	**2**
2.	What are the different types of surface and ground water sources?	**1**	**2**
3.	List out the factors affecting per capita demand.	**1**	**3**
4.	What is water demand? State its types.	**1**	**2**
5.	Select the suitable unit operations and processes and draw the layout plan of water treatment plant.	**2**	**3**
6.	Discuss the factors influencing settling of discrete particles.	**2**	**2**
7.	Describe about the term water softening.	**2**	**2**
8.	How to manage residue in water treatment plant?	**2**	**2**

9.	Examine the prime functions of service reservoirs.	**3**	**3**	
10.	Analyze how to identify leakage in pipelines.	**3**	**2**	
11.	What are the advantages of ring system of water distribution system?	**3**	**2**	
12.	Discuss the various functions of valves in water pipelines.	**3**	**2**	
13.	What is the use of manholes in sewerage system?	**4**	**3**	
14.	Distinguish between self-cleaning velocity and non-scouring velocity.	**4**	**2**	
15.	Discuss the estimation sewage flow.	**4**	**2**	
16.	List out the types of sewerage system.	**4**	**2**	
17.	Distinguish between suspended growth processes and attached growth processes with suitable examples.	**5**	**2**	
18.	What is meant by MLVSS?	**5**	**2**	
19.	Summarize about sludge recycling.	**5**	**3**	
20.	Discuss the objectives of treatment of sludge.	**5**	**2**	

PART- B (5 x 10 = 50 Marks)

		Marks	CO	RBT LEVEL
21. (a)	The population of a town as per census records is given below. Calculate the population in the year 2031 using arithmetical increase method and incremental increase method. Estimate the water demand at 135 LPCD for the year 2031.	**(10)**	**1**	**3**

Census year	1961	1971	1981	1991	2001
Population	39250	54390	68010	83630	99850

(OR)

(b)	Explain the salient features of dry and wet intake towers with the aid of a neat sketch.	**(10)**	**1**	**2**

22. (a)	Design a clariflocculator for a proposed water treatment plant with a capacity of 100 MLD. Make suitable assumptions if needed.	**(10)**	**2**	**3**

(OR)

(b)	Explain with neat sketches about the principle and mechanism of various defluoridation methods.	**(10)**	**2**	**2**

23. (a)	Water supply scheme to be designed for serving a population of 4 lakhs, the storage reservoir is situated at 8 km away from the city and the loss of head from the source to city is 16 m. Calculate the size of supply main by using Weisbach formula as well as Hazen's formula. Assuming a maximum daily demand of 180 liters per day per person and half of the daily supply to be pumped in 8 hours. Assume f' = 0.012 in Weisbach formula and C_H =130 in Hazen's formula.	**(10)**	**3**	**3**

(OR)

(b)	Describe the procedure to analyse the flow in each pipe in the loop using Hardy-Cross method.	**(10)**	**3**	**2**

24. (a)	A city with a population of 1 Lakh has an area of 100 km^2. Rate of water supply is 135 litres per capita per day of which 80% turns into sewer. The average run-off coefficient is 0.6 and intensity of rainfall is 14.5 mm/hr. Estimate the quantity of combined sewage. Take peak factor as 2.	**(10)**	**4**	**3**

(OR)

(b)	Explain the various physio-chemical characteristics of sewage and state their environmental significance.	**(10)**	**4**	**2**

25. (a)	Determine the size of a high-rate trickling filters for the following data. i) Sewage flow = 500 KLD ii) Recirculation ratio = 1.5 iii) BOD of raw sewage =200 mg/l iv) BOD removal in primary tank = 30%	**(10)**	**5**	**3**

v) Final effluent BOD desired = 10 mg/l

(OR)

		Marks	CO	RBT LEVEL
(b)	Explain with neat sketch of a high rate two stage anaerobic sludge digester and explain its salient features.	**(10)**	**5**	**2**

PART- C (1 x 10 = 10 Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	Design six slow sand filter beds from the following data.	**(10)**	**2**	**3**

Population to be served – 60000

Per capita demand – 135 LPCD

Rate of filtration – 160 liters/hour/m^2

Length of each bed = Twice the breadth

Assume maximum demand as 1.8 times the average daily demand. Also assume that 1 unit out of 6 will be kept as standby.

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