R20

SET - 1

II B. Tech II Semester Regular/Supplementary Examinations, July - 2023
ENVIRONMENTAL ENGINEERING
(Civil Engineering)

Time: 3 hours   **Max. Marks: 70**

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1 a) Define water demand? How do you estimate water demand for a town or a city? What factors influence per capita demand, and how can they be managed? [10M]

   b) Explain the flow chart of public water supply system. [4M]

Or

2 a) What are the different sources of water, and how do they compare in terms of quality and quantity? Which sources are typically used for public water supply systems? [7M]

   b) Explain how an infiltration gallery or well for a water supply system is designed. What factors do you need to consider when designing these structures? [8M]

UNIT-II

3 a) Design a rapid gravity filter plant for treating 20×10^6 of water per day. Assume suitable design parameters. [7M]

   b) Explain the different types of disinfection process employed in water treatment. [7M]

Or

4 a) In a continuous flow settling tank, 3.5 m depth and 65 m long the flow velocity is observed to be 1.25 cm/s. estimate the minimum size of particles of relative density 2.65 that may be effectively removed in tank. Assume the kinematic viscosity of water as 0.02 cm^2/s [7M]

   b) Explain the Nalgonda technique of defluorination. [7M]

UNIT-III

5 a) What are the factors that govern the selection of an intake structure for collecting water? [6]

   b) Discuss the process of mass curve analysis for water supply systems. What are the advantages and limitations of this method? [8M]

Or

6 a) Explain the function of a sluice valve. [5M]

   b) How do you determine the capacity of a storage reservoir for a water supply system? What are the factors that influence this decision? [9M]

UNIT-IV

7 a) What factors are considered when estimating sewage flow and storm water drainage? [7M]

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b) How would you design a ventilation system for a sewer system to prevent the buildup of dangerous gases?   [5M]

Or

8 a) With a neat sketch explain how a septic tank works.   [7M]

b) Compare and contrast the advantages and disadvantages of a one-pipe and two-pipe system for house plumbing.   [7M]

UNIT-V

9 a) Explain the difference between ThOD, COD, and BOD in relation to sewage.   [7M]

b) What are the main goals of primary treatment in sewage treatment, and what are some common processes used to achieve these goals?   [7M]

Or

10 a) What are some operational problems that can arise during activated sludge treatment, such as bulking, foaming, or sludge settling issues, and how can these be addressed?   [7M]

b) What is the food-to-microorganism (F/M) ratio for an aeration tank that is 49.9 ft in diameter, with a liquid level of 13.5 ft, if the primary effluent flow averages 3,540,000 gpd, the mixed liquor volatile suspended solids (MLVSS) is 2,912 mg/L, and the BOD5 is 302 mg/L?   [7M]

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UNIT-I

1 a) Why is it important to have a protected water supply system? What are the risks associated with an unprotected water supply? [6M]

   b) What are some of the advantages and disadvantages of using groundwater sources like wells and infiltration galleries? How to ensure that these sources remain sustainable over time? [8M]

Or

2 a) How does the quality of water from lakes and rivers compare to that of groundwater sources like springs, wells, and infiltration galleries? Discuss the factors that can affect water quality in different sources? [8M]

   b) What are the WHO guidelines for drinking water, and how do they compare to the standards set by IS 10500 2012 for water quality in agriculture, industry, and construction? [6M]

UNIT-II

3 a) Explain the theory behind sedimentation and how it is used to treat water? What are some of the key factors that can affect the effectiveness of sedimentation? [7M]

   b) What are the different methods of disinfection that are used to treat water? How does chlorination work? [7M]

Or

4 a) What are some of the challenges associated with removing iron and manganese from water? How can we address these challenges? [7M]

   b) Explain reverse osmosis? What are some of the common problems that can occur with reverse osmosis as a method of water treatment? [7M]

UNIT-III

5 a) Compare and contrast gravity and pressure conduits for conveying water. What are the advantages and disadvantages of each? [8M]

   b) Calculate the required horsepower of a pump for an apartment complex with 100 units, assuming a water demand of 2000 liters per day per unit. [6M]

Or

6 a) Explain the necessity of water appurtenances. [5M]

   b) Determine the hydraulic gradient in a 120 cm diameter old cast iron pipe carrying a discharge of 0.75 m³/sec by using (i) Manning's formula (ii) Darcy-Weisbach formula and (iii) by Hazen-William formula. Assume suitably any data not given [9M]

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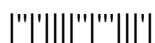
UNIT-IV

7 a) What are sewer appurtenances and why are they important in the sewer system?   [7M]

   b) What are the factors to consider when selecting the type of pipe material for a sewer system?   [7M]

Or

8 a) What are the different types of sewers and their respective design considerations?   [6M]

   b) How would you design the plumbing system for a hotel with 100 rooms, including bathrooms, showers, and kitchenettes?   [8M]

UNIT-V

9 a) What is the trickling filter process, and how does it work to remove organic matter and nutrients from wastewater?   [7M]

   b) What is anaerobic digestion of sludge, and how does it work to reduce the volume and pathogen content of sludge?   [7M]

Or

10 a) What are some common methods of ultimate disposal for sewage, and what are the advantages and disadvantages of each?   [7M]

   b) What are sludge drying beds, and how do they work to remove moisture from sludge before disposal?   [7M]
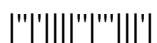
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UNIT-I

1 a) What are some common contaminants found in public water supplies, and how can they be treated or removed? [7M]

    b) Describe the concept of per capita demand and its significance in water supply planning. [7M]

Or

2 a) What are the various sources of water used in water supply schemes? Discuss their merits and demerits from quality and quantity point of view. [7M]

    b) What are some common methods for population forecasting, and what are their strengths and limitations? [7M]

UNIT-II

3 a) What are the different design and operational factors that affect the efficiency of sedimentation in water treatment. [7M]

    b) What are the potential risks associated with using freezing as a water treatment method, and how can these risks be mitigated? [7M]

Or

4 a) How does the theory of disinfection using chlorination and other methods work, and what are the advantages and disadvantages of each method? [7M]

    b) What is defluoridation, and what methods are used to remove excess fluoride from water sources? [7M]

UNIT-III

5 a) To serve a population of 8 lakhs, the storage reservoir is situated 6km away from the city and the loss of head from the source of city is 15 m. calculate the size of the supply main using (i) Hazen -William's formula taking C_H as 130 (ii) Darcy-Weisbach formula taking f as 0.012. Assume maximum daily demand of 225 lpcd and half of the daily supply is to be pumped in 8 hours. [10M]

    b) Discuss the various types of pipes used for water conveyance. [6M]

Or

6 a) Describe the various types of pipe joints used in water supply systems. What are their advantages and disadvantages? [9M]

    b) Why are air valves important in a water distribution network? [5M]

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UNIT-IV

7 a) What are the methods for cleaning and ventilating sewers? [7M]

   b) A combined sewer of circular section is to be laid to serve a particular area. Design the sewer from the following: [7M]
Area to be served = 100 hectares
Population = 90000
Impermeability factor = 0.50
Time of entry = 3 min.
Time of flow = 17 min.
Rate of water supply = 135 lpcd. Assume any other data if necessary.

Or

8 a) With a neat sketch explain about manhole. [7M]

   b) Calculate the discharge for a stoneware sewer, running full. The diameter of the sewer is200 mm and it is laid at a slope of 1 in 72. Take n = 0.013 in Manning's formula. [7M]

UNIT-V

9 a) Describe in brief different types of biological treatment of wastewater using attached culture. [7M]

   b) What is crown corrosion, and how can it impact the longevity and safety of sewage disposal systems? [7M]

Or

10 a) An activated sludge tank is 40 m long, 15 m wide and has a depth of 4 m. The wastewater flow is 8 mL/day. The raw BOD_5 is 180 mg/L. The mixed liquid suspended solids concentration is 2200 mg/L. compute F/M ratio for the system. Assume 35% of raw BOD is removed in primary clarifier. [7M]

   b) What are some innovative or emerging technologies for sewage disposal, such as nutrient recovery or energy production, and how do these differ from traditional disposal methods? [7M]

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UNIT-I

1	a)	What do you understand by 'per capita demand' of water? How is it determined?	[7M]
	b)	How can advancements in technology be used to improve the safety and efficiency of public water supply systems?	[7M]

Or

2	a)	What is per Capita Water Demand? Explain variations in Water Demand.	[5M]
	b)	Define incremental increase method? Determine the population of city in 2046 by arithmetic increase method & Geometric increase method?	[9M]

Year	1965	1975	1985	1995	2005
Population in thousand	87	110	145	180	210

UNIT-II

3	a)	Briefly explain the theory of plain sedimentation, Derive the Stoke's law for sedimentation.	[10M]
	b)	Explain about Removal of Iron and Manganese.	[4M]

Or

4	a)	Describe the theory of water filtration.	[8M]
	b)	Discuss the advantages and disadvantages of chlorine gas over bleaching powder.	[6M]

UNIT-III

5	a)	Describe the various types of pipe joints used in water supply systems. What are their advantages and disadvantages?	[7M]
	b)	Explain the process of laying and testing pipeline systems for water supply. What are the important factors to consider during this process?	[7M]

Or

6	a)	Water is to be supplied to a town of population 1.5 lakhs, if water works is situated at alower elevation of 50m than the water level in the source. Determine the size of the gravity main to convey water from source to the water work, if the length of the gravitymain is 25km and the per capita demand of the town is 150 litres/day/capita. f = 0.075.	[7M]
	b)	Write the advantages and disadvantages of four types of distribution network.	[7M]

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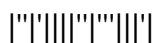
UNIT-IV

7 a) What are the different systems of plumbing-sanitary fittings and accessories used in house plumbing?   [6M]

   b) Write the design of drainage in Gated Communities.   [8M]

Or

8 a) Discuss any two types of Sanitary fittings.   [5M]

   b) Write about (i) inverted siphons. (ii) Calculate the size and capacity of a septic tank needed for a family of 4.   [9M]

UNIT-V

9 a) What are oxidation ponds, and how do they differ from other treatment systems in terms of their design and operation?   [7M]

   b) Design an Activated sludge process for treating 4 MLD wastewater with a BOD of 180 mg/L. Assume efficiency of ASP unit as 90% and diffused aeration is employed   [7M]

Or

10 a) What are rotating biological contactors (RBCs), and how do they work to remove organic matter and nutrients from wastewater?   [7M]

   b) Design RBC modules to treat 6 MLD of primary settled sewage with the following design parameters: [7M]
     i.   Hydraulic loading rate = 110 L/m^2/d
     ii.   Diameter of disc = 3.5 m
     iii.   Center to center spacing of discs = 20 m