



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech VII SEMESTER END EXAMINATIONS (REGULAR/SUPPLEMENTARY) - DECEMBER 2022

Regulation: R18

ENVIRONMENTAL ENGINEERING

Time: 3 Hours

(CIVIL ENGINEERING)

Max Marks: 70

Answer FIVE Questions choosing ONE question from each module

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

MODULE – I

- (a) What is meant by design period and population forecasts? Describe why population forecasting is necessary in the design of public water supply schemes? [BL: Understand| CO: 1|Marks: 7]
(b) The population data of a city is given in Table 1:

Table 1

Year	1961	1971	1981	1991	2001	2011
Population	76000	90000	115000	150000	187000	225000

Estimate the population of the city in 2021 and 2025. [BL: Apply| CO: 1|Marks: 7]

- (a) Describe the water demand for various purposes and list the various factors affecting the water demand. [BL: Understand| CO: 1|Marks: 7]
(b) As per the census records for the years 1911 to 1971, the population of a town is given in the Table 2. Assuming that the scheme of water supply was to commence in 1996, it is required to estimate the population of 10 years i.e. in 2006 and also the intermediate population after 15 year since commencement. [BL: Apply| CO: 1|Marks: 7]

Table 2

Year	1911	1921	1931	1941	1951	1961	1971
Population	40185	44522	60395	75614	98886	124230	158800

MODULE – II

- (a) State the functions of a service reservoir and sketch the sectional elevation of the same showing the various appurtenances. [BL: Understand| CO: 2|Marks: 7]
(b) Design a set of rapid gravity filters for treating water required for a population of 65000, the rate of supply being 180 l/p/d /p. The filters are rated to work 6000 l/h/sq.m. Assume whatever data is necessary? [BL: Apply| CO: 2|Marks: 7]
- (a) Why coagulants are used in the water treatment? Enlist various coagulants used along with their effectiveness in sedimentation of water. [BL: Understand| CO: 2|Marks: 7]

- (b) For disinfecting water supply, it is required to treat 500,000 litres of daily supply with 0.5ppm of chlorine. If the disinfectant is available in the form of bleaching powder containing 30% of available chlorine, calculate the amount of bleaching powder required to treat the daily flow of water. [BL: Apply| CO: 2|Marks: 7]

MODULE – III

5. (a) Outline the various stages of solid waste management . Explain in detailed about components of integrated solid waste management. [BL: Understand| CO: 3|Marks: 7]
- (b) In a pond with volume 20×10 m that is fed by a waste material with a flow rate of 5 m/s and pollution concentration equal to 20 mg N. In another pipe there is sewage fall at the rate of 0.2 m/s in the pond which has a concentration of 50 mg/l and reaction rate coefficient 0.20/day. Find the steady state concentration in the lake. [BL: Apply| CO: 3|Marks: 7]
6. (a) Discuss the factors to be considered in doing the incineration process. Write short note on environmental factors in sanitary landfill sites. [BL: Understand| CO: 4|Marks: 7]
- (b) Municipal solid waste contains organic and inorganic material. When analyzed by the combustion method, 0.20 gm of an organic substance yielded i) 0.157 gm of carbon dioxide and 0.11 gm of water ii) 74.6 ml of nitrogen gas at N.T.P. Find the empirical formula of the substance. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

7. (a) Identify the purpose of preliminary treatment of sewage? Write a brief note on the various units employed for the same. How are grit and screenings disposed off? [BL: Understand| CO: 5|Marks: 7]
- (b) Design a conventional activated sludge plant to treat settled domestic sewage with diffused air aeration system for the following data: population=120000, per capital sewage contribution=160 lpcd, settled sewage BOD₅=200 mg/l, effluent BOD₅ required=15 mg/l. [BL: Apply| CO: 5|Marks: 7]
8. (a) Summarize combined collection of waste waters and storm waters system with details of material used in this system . [BL: Understand| CO: 5|Marks: 7]
- (b) Design the section of a combined circular sewer from the given data: area=200 hectares; population=75000, maximum permissible velocity=3.2 m/s; time of entry=5 minutes; time of flow=25 minutes; rate of water supply=135 lpcd; impermeable factor=0.75, usual values may be assumed for the additional data [BL: Apply| CO: 5|Marks: 7]

MODULE – V

9. (a) Discuss sludge digestion and its stages in digestion process. Enlist factors affecting sludge digestion. [BL: Understand| CO: 6|Marks: 7]
- (b) Design of rectangular plain sedimentation tank to treat 12×10^6 lit/day. Assume a detention period of 6 hours and velocity of flow as 20 cm/min. [BL: Apply| CO: 6|Marks: 7]
10. (a) Explain the objects of sewage treatment plant. Differentiate between aerobic and anaerobic treatment process. [BL: Understand| CO: 6|Marks: 7]
- (b) Design a septic tank for a hostel housing 150 persons. Also design the soil absorption system for the disposal of the septic tank effluent, assuming the percolation rate as 20 min/cm? [BL: Apply| CO: 6|Marks: 7]

