Hall Ticket No | | | | | | | | | | |

Question Paper Code: ACEC34

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech VII SEMESTER END EXAMINATIONS (REGULAR) - DECEMBER 2023
Regulation: UG-20
ENVIRONMENTAL ENGINEERING

Time: 3 Hours **CIVIL ENGINEERING** **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Write a short note on the following type of distribution system layout
   (i) Ring system
   (ii) Radial system

   [BL: Understand| CO: 1|Marks: 7]

   (b) The population of 5 decades from 1930 to 1970 is given below in Table 1. Find the population after one, two, three decades beyond the last known decade, by using Geometric increase method .

Table 1

Year	1930	1940	1950	1960	1970
population	25,000	28,000	34,000	42,000	47,000

[BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Summarize sedimentation tank and elaborate the types of sedimentation tank.

   [BL: Understand| CO: 2|Marks: 7]

   (b) Design the appropriate dimensions of a set of rapid gravity filters for treating water required for a population of 50,000, the rate of supply being 180 litres per day per person. The filters are rated to work 5000 litres per hour per sq.m. Assume the necessary data.

   [BL: Apply| CO: 2|Marks: 7]

MODULE – III

3. (a) Outline the tests carried out in sludge to determine the physical characteristics.

   [BL: Understand| CO: 3|Marks: 7]

   (b) The 5 day BOD at 30^0 C of a sewage sample is 120mg/L. Calculate 5 days BOD at 20^0C. Assume deoxygenation constant at 20^0C, K = 0.1/day. [BL: Apply| CO: 3|Marks: 7]

4. (a) Discuss about disposal by dilution and list the conditions favoring disposal by dilution. [BL: Understand| CO: 4|Marks: 7]

   (b) Find the minimum velocity and gradient at which coarse quartz sand is transported without hindrance through a 304.8mm diameter sewer that is flowing full. Assume the particle diameter is 0.1 cm, the particle specific gravity is 2.65, the sediment characteristic factor is 0.04, and n is 0.013. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Interpret the characteristics of high-rate trickling filters in comparison with conventional rate filters. [BL: Understand| CO: 5|Marks: 7]

   (b) The sewage is flowing at 4.5 million litres per day from a primary clarifier to a standard rate trickling filter. The 5- day BOD of the influent is 160 mg/l. The value of the adopted organic loading is to be 160 $gm/m^3/day$, and surface loading 2000 $l/m^2/day$. Determine the volume of filter and its depth. Also calculate the efficiency of this filter unit. [BL: Apply| CO: 5|Marks: 7]

6. (a) Enumerate grit chamber and elaborate the necessity of grit chamber in treatment process and briefly explain its types. [BL: Understand| CO: 5|Marks: 7]

   (b) A rectangular grit chamber is designed to remove particles with a diameter of 0.2 mm, specific gravity 2.65. Settling velocity for these particles has been found to range from 0.016 to 0.022 m/sec, depending on their shape factor. A flow through velocity of 0.3m/sec will be maintained by proportioning weir. Determine the channel dimension for a maximum waste water flow of 10,000 cu.m/day. [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) Categorize different stages of sludge digestion process in a "Digestor" with a neat sketch. Illustrate the constructional details of sludge digestion tank [BL: Understand| CO: 6|Marks: 7]

   (b) Design a sludge digestion tank for 40,000 people. The sludge content per capita per day is 0.068 kg. The moisture of sludge is 94%. The specific gravity of wet sludge is 1.02 and 3.5 per cent of digester volume is daily filled with the fresh sludge, which is mixed with digested sludge. [BL: Apply| CO: 6|Marks: 7]

8. (a) Enumerate working principles and design of soak pits. Differentiate between attached growth process and suspended growth process. [BL: Understand| CO: 6|Marks: 7]

   (b) Design the dimensions of a septic tank for a small colony of 150persons provided with an assured water supply from municipal head- works at a rate of 120 litres per person per day. Assume any data you need [BL: Apply| CO: 6|Marks: 7]