INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR

Test 1 2021-22

Date of Examination: **22.05.2022** Session: **FN** Full Marks: **60** Duration: **1.5 h**
Subject No.: **EV10003** Subject Name: **ENVIRONMENTAL SCIENCE** **Section: 15 & 16**
Specific charts, graph paper, log book etc., required: **NIL**
Special Instructions (if any): *All questions are compulsory.*

A. FILL IN THE BLANKS

Part 1 (5x2=10)

1. Water demand in cities without sewerage network is _____
2. Alum is added as _____ in water treatment plant
3. Most widely used on site sanitation facility in household level is _____
4. BOD removal is mainly targeted in _____
5. Hydraulic retention time in the activated sludge process is _____

B. **MATCH THE COLUMNS 'A' AND 'B': (1x5=5)**

A	**B**
a. Stokes law	**i.** Coliform determination
b. Hazen–Williams equation	**ii.** Friction loss determination
c. Arithmetic increase method	**iii.** Settling velocity determination
d. Jar Test	**iv.** Population forecasting
e. MPN	**v.** Alum dose determination

C. STATE TRUE OR FALSE (5x1=5)

1. Plain sedimentation can remove colloidal particle
2. Water supply is normally provided through gravity pipe
3. Organic content is represented as BOD
4. Chlorination is used for COD removal
5. UV light is used for disinfection of water

D. Solve the flowing problems (4x5=20)

1. If 3 day BOD of a domestic wastewater at 27^0C is 300 mg/l. Find 10 day BOD at 5^0C and 7 day BOD at 10^0C. Assume, K_{20} = 0.23 d^{-1} (base e)

2. A city has a population at 1971, 1981, 1991, 2001, 2011 are 20000, 30000, 40000, 59000, 75000. What will be the population of 2041 (use geometric increase method)

3. For a water sample the total alkalinity is 100 mg/l as $CaCO_3$. The Ca^{++} is 250 mg/l, Mg^{++} is 100 mg/l. Find out the different hardness parameters.

4. An ASP is proposed for a flow of 1 MLD and the incoming BOD is 250mg/L. Compute its volume of the tank for a HRT of 4 h and F/M ratio of 0.3.

5. A 100 ml water sample is drawn on to an empty dry container whose initial weight is 100.68 gm. After oven drying the sample at 103^0C for 24 hours its final weight measured to be 100.94 gm. Then total solid's concentration in mg/l.

E. Write the following questions (2x10=20)

1. Explain the various components of a wastewater treatment plant with process flow diagram and provide the purpose of each units.
2. Write short note on the following:
    a. Trickling filter
    b. COD
    c. Grit chamber
    d. Total suspended solids
    e. Clariflocculator

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