Paper Code: CE-602 **Roll No.** | | | | | | | | | | |

B.Tech.
(SEM VI) EVEN SEMESTER EXAMINATION, 2015-16
ENVIRONMENTAL ENGINEERING-II

[Time:3 hrs.] **[Max. Marks: 100]**

Note:
(i) Attempt all questions.
(ii) Usual notations have been followed.
(iii) Assume any data suitably, if not given.

1. Attempt any FOUR parts of the following: **[5x4=20]**

(a) An analysis of suspended solids is run as follows: (i) A fiberglass filter is dried to a constant mass of 0.137 g; (ii) the tare mass of an evaporation dish has been determined to be 327.485 g; (iii) 100 mL of sample is drawn through the filter; (iv) the filter and residue are placed in a drying oven at 104°C until a constant mass of 0.183 g is reached; (v) the filtrate is placed in the evaporation dish and evaporated to dryness, and the total mass of the dish and solids is found to be 327.51 g; and (vi) after evaporating the filtrate, the evaporation dish and residue is placed in a muffle furnace at 550°C for 1 hr. and after cooling, the mass is found to be 327.498 g. Determine the suspended solids, filterable solids and filterable volatile solids concentration in mg/L.

(b) Describe various beneficial uses of water along with water quality requirement as prescribed by CPCB.

(c) BOD_5 at 20°C of sewage is 250 mg/L. Find out BOD_3 at 27°C of sewage.

(d) What do you mean by recycling and reuse of treated wastewater? Explain briefly.

(e) Determine the theoretical Oxygen Demand (ThOD) for glycine ($CH_2(NH_2)COOH$ using the following assumptions:
(i) In the first step, the organic carbon and nitrogen is converted to CO_2 and NH_3 respectively.
(ii) In the second and third steps, the NH_3 is oxidized sequentially to nitrite and nitrate.

(f) Briefly explain the objectives of wastewater treatment.

2. Attempt any TWO parts of the following: **[10x2=20]**

(a) Describe various type of screens (with help of sketches) used in wastewater treatment and explain the disposal methods of screenings. Write down formula for calculating head loss through screen.

(b) Explain the procedure of determining the removal efficiency for flocculent settling.

(c) A flocculation chamber 30 m long, 12 m wide and 4.5 deep is to treat 75 MLD of water. It is equipped with 12 m long, 0.3 m wide paddles parallel to and moved by four horizontal shafts which rotate at a speed of 2.5 rpm. The center line of the paddle is 1.8 m from the shaft which is at mid. depth of the tank. Two paddles are mounted on each shaft one opposite to the other. If the mean velocity of the water is 25% of the velocity of paddle, find:
(i) Power consumption.
(ii) Time of flocculation.
(iii)Value of G

Assume kinematic viscosity, $\nu = 1.31 \times 10^{-6}$ m^2/sec

3. Attempt any TWO parts of the following: **[10x2=20]**

(a) Clean water at 20°C is passed through a bed of uniform sand at a filtering velocity of 5.0 m/h. The sand grains are 0.4 mm in diameter with a shape factor of 0.85 and a specific gravity of 2.65. the depth of the bed is 0.67 m and the porosity is 0.4. Determine the head loss through the bed.

(b) Explain disinfecting action of chlorine and its dependency on the pH. Describe formation of chloramines.

(c) Design a zeolite softener for obtaining hardness of 50mg/ L (as $CaCO_3$) in 25 kiloliter treated water supply when the hardness of raw water is 400mg/ L (as $CaCO_3$). Assume:
   (i) The softening process has to be completed in 2 shifts of 8 hours each.
   (ii) Ion exchange capacity of the zeolite = 10 kg of hardness / m^3 of zeolite.
   (iii) Salt required for regeneration of exhausted zeolite = 50 kg of hardness / m^3 of zeolite.

4. Attempt any FOUR parts of the following: **[5x4=20]**

(a) Differentiate between preliminary, primary, secondary and tertiary treatment processes.
(b) Describe the function and use of grit chamber.
(c) Explain briefly the theory of organic matter removal.
(d) What are the various modifications of activated sludge process.
(e) Determine the amount of methane produced in m^3 from 1 kg of BOD_L stabilized at STP. Assume that the BOD_L contribution is due to glucose ($C_6H_{12}O_6$) and anaerobic decomposition of glucose produces CO_2 and CH_4.
(f) Explain functioning of R.B.C.

5. Attempt any TWO parts of the following: **[10x2=20]**

(a) What do you understand characteristics of sound and its measurement? Write down prevailing noise standards in India.

(b) Classify various types of solid wastes and explain disposal of refuse by sanitary land filling.

(c) Write short notes on:
   (i) Vermiculture
   (ii) Fluidized bed reactor