

B.TECH.**THEORY EXAMINATION (SEM–VI) 2016-17****ENVIRONMENTAL ENGINEERING – II***Time : 3 Hours**Max. Marks : 100**Note : Be precise in your answer. In case of numerical problem assume data wherever not provided.***SECTION – A****1. Attempt the following:****10 x 2 = 20**

- (a) What is meant by toxic compound? Give an example of any two.
- (b) Define COD.
- (c) Define displacement efficiency.
- (d) What is meant by short circuiting?
- (e) What is Non-carbonate hardness?
- (f) Define sterilization.
- (g) Draw a flow chart for wastewater treatment processes.
- (h) Differentiate oxidation ditch and oxidation pond.
- (i) What is UASB? Write its uses.
- (j) What are called as Hazardous Waste?

SECTION – B**2. Attempt any five parts of the following questions:****5 x 10 = 50**

- (a) Enumerate the important water-borne diseases in India, and describe how, with your knowledge of various branches of science applicable to sanitary engineering, you would set about to prevent the incidence of the diseases.
- (b)
 - (i) The BOD of a sewage incubated for one day at 30° C has been found to be 110 mg/l. What will be the 5-day 20°C BOD? Assume $K=0.12$ (base 10) at 20°C.
 - (ii) The BOD₅ of a waste has been measured as 500 mg/l. If the rate constant $K' = 0.26$ / day (base e), what is the ultimate BOD of the waste? What proportion of BOD_u would remain unoxidised after 20 days?
- (c) Design a coagulation-cum-sedimentation tank with continuous flow for a population of 60,000 persons with a daily per capita water allowance of 120 litres. Make suitable assumptions where needed.
- (d) Elaborate the constituents of a clariflocculator with neat sketch.
- (e) Compare the slow sand filter and rapid gravity filter.
- (f) **Explain the following terms.**
 - (i) Double- Chlorination
 - (ii) Break-point Chlorination.
 - (iii) Super-Chlorination.
- (g) Design an oxidation ditch for a community with the following data:
 - (i) Population of the community: 6000 Persons.
 - (ii) Organic load of sewage : 40 g BOD per capita per day.
 - (iii) Sewage flow : 160 litre / capita / day.
 - (iv) Permissible BOD of effluent : 20 mg/litre.
- (h) Design a septic tank for a colony of population 150 persons. And draw a neat sketch with details. (Assume data wherever necessary)

SECTION – C

Attempt any two parts of the following questions:

2 x 15 = 30

3.
 - (a) What are various chemical characteristics of waste water which affect the selection and operation of various types of treatment process? Explain in detail.
 - (b) Find the settling velocity of a discrete particle in water under conditions when Reynold's number is less than 0.5. The diameter and specific gravity of the particle is 5×10^{-3} cm and 2.65, respectively. Water temperature is 20°C (kinematic viscosity ν of water at $20^\circ \text{C} = 1.01 \times 10^{-2} \text{ cm}^2 / \text{sec}$).
4.
 - (a) Elaborate the Base-Exchange process for hardness removal.
 - (b) What is the purpose of preliminary treatment of sewage? Write the brief note on various units employed for the same.
5. With the help of neat sketch explain the functions and operations of UASB. And also state its advantages.