

PRINCIPLES OF ENVIRONMENTAL ENGINEERING*Time: Three Hours**Maximum Marks: 100**Answer five questions, taking ANY TWO from Group A, any two from Group B and all from Group C.**All parts of a question (a, b, etc.) should be answered at one place.**Answer should be brief and to-the-point and be supplemented with neat sketches.**Unnecessary long answer may result in loss of marks.**Any missing or wrong data may be assumed suitably giving proper justification.**Figures on the right-hand side margin indicate full marks.***Group A**

1. (a) Explain the energy flow within an ecosystem with a neat sketch. 10
(b) Describe the components of aquatic ecosystem. 10
2. (a) Discuss the various types of environmental pollution. 10
(b) Explain various air pollutants and their effects. 10
3. (a) Air quality standard for NO₂ of a place is set at 470 µg/m³ at atmospheric pressure and at 25⁰C. Express the concentration in ppm. 6
(b) What do you understand by the term PM-10? What is its significance? Differentiate between dust, fume, smoke, mist and fly ash. 6
(c) What do you understand by “point” and “non-point” sources of pollution? Briefly explain some of the major types of water pollutants. 8
4. (a) Explain the variation in quantity of water consumption and different types of demand. 6
(b) Using the incremental increase method, forecast the population in the next decade for the following data: 8
Year: 1960 1970 1980 1990 2000

Population: 25000 28000 34000 42000 47000

- (c) Describe about the sources and characteristics of solid wastes. The initial volume of a mass of solid waste is 15 m^3 . After compaction, the volume is reduced to 3 m^3 . Compute the percent volume reduction and compaction ratio. 6

Group B

5. (a) Enumerate the unit operations used in wastewater treatment and the principle used thereof. Draw a layout plan for a typical wastewater treatment system. 10
- (b) Explain the principle of biological treatment of wastewater. Name four common biological treatment processes. Differentiate between aerobic and anaerobic processes. 10
6. (a) Explain where the following terms are used: hydraulic retention time, mean cell residence time, mixed liquor suspended solids and sludge volume index. 10
- (b) The BOD of a sewage sample, incubated for one day at 30°C , has found to be 120 mg/l . What will be its 5 days 20°C BOD, if the values of reaction constant K_1 are 0.1 and 0.16, respectively at 20°C and 30°C . 10
7. (a) Draw the flow sheet showing the conventional treatment of water taken from (i) surface source (ii) sub surface source (iii) domestic sewage. Name the different units. 10
- (b) Describe the characteristics of a good disinfectant. Write a detailed note on various methods of disinfection. 10
8. (a) Write an explanatory note on self cleansing velocity in sewers. Differentiate between self cleansing and non scouring velocities in sewers. 6
- (b) A sewage treatment plant influent has an average total suspended solids (TSS) concentration of 250 mg/l . If the average effluent TSS concentration is 20 mg/l , what is the removal efficiency for TSS? If the flow rate is 5 ml/d , how many kilograms of suspended solids are discharged in the plant effluent each day. 8
- (c) Under what circumstances septic tanks are used? Explain how the septic 6

tank effluents are to be disposed.

Group C

9. Answer the following in brief: 20
- (i) Suspended materials are objectionable in drinking water because
 - (ii) Greenhouse effect is due to increase
 - (iii) Traps provided at the end of soil pipes and sullage pipes, prevent
 - (iv) Aeration is done in biological treatment to supply to micro organism
 - (v) The ratio of flow rate to volume is
 - (vi) Lpcd means
 - (vii) The quantity recommended by BIS for domestic supply is lpcd.
 - (viii) The minimum dissolved oxygen required in water for tropical fishes is mg/L.
 - (ix) The vertical temperature gradient in atmosphere is known as
 - (x) The process of aeration is not required for surface waters because

(Refer our course material for answers)