3 Hours

Total Marks: 100

1. Attempt **all** questions.
2. **All questions** carry **equal** marks.
3. Draw **neat labeled diagrams** wherever necessary.
4. Use of **log tables** and **non-programmable calculator** is **allowed**.

Q.1 a. Do as directed. (Any Six) **06**

1. What are photovoltaic cells?
2. Give any one advantage of renewable energy.
3. Fill in the blank:
   _____ is the final stage of anaerobic digestion in biogas production.
4. Give any one example acidogenic bacteria used in production of biogas.
5. Name any one component of biogas.
6. Define biomass.
7. Fill in the blank:
   _____ is the heating of biomass in the absence of air at temperatures of 300-500^{0}C.
8. Write any two advantages of biodiesel over diesel.
9. State True or false.
   Co-firing is the firing of a renewable fuel such as biomass with coal, natural gas and oil mainly for the generation of electricity.

Q.1 b. Answer the following questions (Any Two) **14**

1. Describe factors affecting biogas production.
2. Explain different stages in production of ethanol.
3. Elaborate on Hydrogen as a renewable fuel.

Q.2 a. Do as Instructed. (Any Six) **06**

1. Fill in the blank:
   Compounds that are highly resistant to biodegradation are known as _____.
2. State one example of immobilized enzyme for treatment of waste water
3. Define : Cometabolism.
4. State one disadvantage of biosensor.
5. Give one example of hazardous waste.
6. State one advantage of fluidized bed reactor
7. State one disadvantage of contact digester.
8. Give one disadvantage of activated sludge process.

9. State one disadvantage of Rotating biological contractor.

Q.2 b. Answer the following questions (Any Two) 14

1. Discuss the concept of innovative reactor with suitable examples.

2. Discuss the construction and working of Rotating biological contractor. Add a note on its advantages.

3. Describe the method of processing and disposal of medical wastes.

Q.3 a. Attempt the following objectives as directed: (Any Six) 06

1. Mention any one objective of waste water treatment.
2. Name the industrial effluent consisting of inhibitory chemical content.
3. What is incidental removal?
4. Mention any one difference between extracellular and intracellular enzymes involved in biotreatment.
5. Fill in the blank:
   An example of an interaction existing between organisms present in mixed culture is _____.
6. Fill in the blank:
   The plasmid CAM is involved in the degradation of the substrate _____.
7. Define biosorption.
8. Name a bacteria used in biosorption.
9. What is dual metal situation?

Q.3 b. Elaborate on the following: (Any Two) 14

1. Categories of important microbes involved in biotreatment

2. Use of fungi in biosorption

3. The types of reactors used in biosorption and the advantages of biosorptive processes over physico-chemical methods

Q.4 a. Answer the following objectives as instructed: (Any Six) 06

1. Fill in the blank:
   _____ is formed under the earth's surface by the decomposition of organic matter over millions of years.
2. Fill in the blank:
   A _____ resistant strain of *S.marcesens* was isolated from tannery effluents.
3. Define distiller's grains.
4. Define mordant dyes
5. Define scrubbers.

6. Name an enzyme used for lignin degradation in paper industry
7. Name any one non-fuel products obtained from petroleum industry
8. What is chamoising?
9. What is steam stripping?

Q.4 b. Give an account of the following questions: (Any Two) 14

1. Characteristics and Environmental impact of tannery effluents
2. Secondary treatment of distillery effluent
3. Waste treatment of pharmaceutical industry

Q.5 Write Short notes on the following (Any Four) 20

a. Petrocrops
b. Biostimulation and bioaugmentation
c. Sources of heavy metal pollution
d. Composting
e. Advantages of biosensors
f. Physical and chemical treatment of dye industry effluent