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. Fill in the blank:
   The sun's energy can also be made directly into electricity using _____.
2. What are Petrocrops?
3. Define Acidogenesis.
4. Give any one example of methanogenic bacteria used in production of biogas.
5. Fill in the blank:
   _____ is the process where the biomass is heated in an oxygen limited atmosphere to produce gaseous fuel.
6. State True or false.
   Biogas is a mixture of gases produced when organic material is broken down aerobically.
7. Define volatile solids.
8. Give any one algae producing hydrogenase enzyme.
9. State True or false.
   Pyrolysis is the heating of biomass in the absence of air at temperatures of 300-500^{0}C.

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

1. Define renewable energy. Explain any three sources of renewable energy.
2. Elaborate on transesterification process for the production of biodiesel.
3. Explain biological production of hydrogen.

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

1. Fill in the blank:
   _____ is a by-product of 2,4,6 trinitrotoluene and toluene diisocyanate.
2. State one example of organism used as a bioindicator in metal contamination
3. Give one advantage of biosensor.
4. Fill in the blank:
   _____ is the metabolism of an organic compound in presence of a growth substrate.

5. Give one example of non-hazardous waste.
6. State one advantage of Inverse fluidized bed biofilm reactor.
7. Give one application of contact digester.
8. State one advantage of anaerobic fermentation over aerobic fermentation.
9. Give one advantage of Rotating biological contractor.

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

1. Comment on - The chemical properties of xenobiotic compounds influencing their biodegradability.
2. Discuss the construction and working of Fluidised Bed reactor. Add a note on its advantages.
3. Elaborate on the role of bioindicators in pollution monitoring with suitable examples.

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

1. Give an example of an inorganic ion required for microbial activity in waste water treatment.
2. Name the industrial effluent consisting of hydrocarbon content.
3. Fill in the blank:
   The organic matter solvents toxic to biological processes is _____.
4. Give an example of bacterial flora of aerobic treatment systems.
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 *OCT* is involved in the degradation of the substrate _____.
7. Define meander.
8. Name an algae used in biosorption.
9. State the application of Biosorbent M.

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

1. Impact of pollutants on biotreatment
2. Use of bacteria in biosorption
3. Factors affecting biosorption

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

1. Fill in the blank:
   _____ are thermal degradation products of sugars.
2. Name any one anaerobic device for treatment of distillery waste.
3. Name any one fungi used for bioremediation of azo dyes
4. Name any one method of curing hides in leather industry
5. Name any one natural dye obtained from animals.

6. Name any one non-wood fibre used for manufacture of paper.
7. Name any one solid support media used in fixed film bioreactor
8. Name the genetically engineered bacteria used for degradation of oil spills.
9. What is VOC's?

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

1. Treatment of tannery effluents
2. Characteristics of distillery effluent
3. Treatment of dairy waste water

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

a. Biomass energy
b. Packaged microorganism in wastewater treatment
c. Sources of heavy metal pollution
d. Biosensors
e. Application of immobilized biocatalyst in waste water treatment
f. Tertiary and enzymatic treatment of paper and pulp industry effluent

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