3 Hours

Total Marks: 100

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

Q.1 a. **Select the correct alternative: (Any Six)** **06**
1. Biodiesel originates from _____.
   a) petroleum b) natural gas c) biomass d) coal)
2. Biogas primarily consists of _____.
   a) Oxygen b) Nitrogen c) Carbon dioxide d) Methane)
3. Biogas is generated through the decomposition of organic matter in the absence of _____.
   a) oxygen b) carbon dioxide c) sunlight d) water)
4. Biomass energy is obtained from _____.
   a) Burning coal b) Burning wood c) Burning oil d) Burning natural gas)
5. Ethanol is chiefly derived from _____.
   a) Corn b) Wheat c) Soybeans d) Rice)
6. Geothermal energy harnesses heat from the _____ to produce power.
   a) Sun b) Wind c) Earth d) Water)
7. Hydropower exemplifies _____ energy.
   a) Renewable b) Non-renewable c) Nuclear d) Fossil fuel)
8. Microbial hydrogen production involves utilizing _____.
   a) Bacteria b) Fungi c) Viruses d) Algae)
9. Wind turbines transform _____ into _____.
   a) Heat, Light b) Light, Heat c) Wind, Electricity d) Water, Oxygen)

Q.1 b. **Answer the following questions: (Any Two)** **14**
1. Detail the Biogas production process and explore its potential applications.
2. Compare and contrast the benefits of renewable energy sources with conventional ones.
3. Elaborate on the biological mechanism behind hydrogen production.

Q.2 a. **Do as directed: (Any Six)** **06**
1. The semaphore crab has been shown to be a good indicator of _____ in Australian estuaries.   (Lead, mercury, copper, arsenic)
2. Give any one example of biodegradable waste.
3. State true or false: TNT is a xenobiotic compound.
4. Give any one example of support medium used in fluidised bed reactor.
5. Name any aerobic wastewater treatment system which utilises fixed film process.

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6. Name the marker gene from the jellyfish *Aequorea victoria* which can be used as a genetic indicator for monitoring of pollution

7. Name any one method of immobilization of biocatalyst.

8. Give any one example of an organism which can decolorize Kraft lignins.

9. Name any one enzyme involved in biodegradation of xenobiotic compounds by bacteria.

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

1. Give a brief account on Activated sludge process.

2. Describe various methods of treatment and disposal of non- hazardous solid wastes.

3. Elaborate on the role of bioindicators in pollution monitoring with suitable examples.

Q.3 a. Select the correct alternative: (Any Six)   **06**

1 Simplicity, stable nature and mostly——— organics in sewage make microbiology and biochemistry study of sewage treatment relatively straightforward.
   a) digestible   b) developing
   c) destroyable   d) deleting

2 Metal processing mine wastes are mainly rich in ——- material
   a) organic   b) inorganic
   c) stable   d) microbial

3 In ——— culture, cometabolism can be considered as a dead end transformation without benefit to that microorganism.
   a) impure   b) pure
   c) degraded   d) metabolic

4 Agricultural and food industry wastes are rich in ———matter.
   a) inorganic   b) organic
   c) stable   d) heavy metals

5 The extra chromosomal ———— materials are called plasmids.
   a) DNA   b) RNA
   c) protein   d) carbohydrate

6 Packaged organisms reduce————— phase.
   a) lag   b) log
   c) stationary   d) death

7 ———- is the most common coagulant in wastewater treatment.
   a) Alum   b) Ferric sulphate
   c) Limestone   d) Coal

8 Bioaugmentation involves—————.
   a) elimination of sludge   b) plant usage for bioremediation
   c) addition of microbes to a clean-   d) Bioventing.
      up site.

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9 ———— algae is used in biosorption of Uranium from seawater.
  - a) *Sargassum natan*
  - b) *Fucus vesiculosus*
  - c) *Halimeda opuntia*
  - d) *Chlorella vulgaris*

Q.3 b.   Discuss the following: (Any Two)   **14**
  1. Role of fungi in biosorption with examples.
  2. Impact of pollutants on bio treatment.
  3. Sources of heavy metal pollution and toxicological properties of heavy metals.

Q.4 a.   Select the correct alternative: (Any Six)   **06**
  1 Distillery effluents contain a dark brown pigment called————.
    - a) Melanoidin
    - b) Azurite
    - c) Quinacridone
    - d) Kaolinite
  2 Which of the following metals is present in spent wash?
    - a) Fe
    - b) Al
    - c) Mg
    - d) Li
  3 Stone ground pulping is an example of — pulping process.
    - a) mechanical
    - b) chemical
    - c) biochemical
    - d) thermal
  4 The first ligninolytic peroxidase was isolated from————.
    - a) *P. chrysosporium*
    - b) *B. adusta*
    - c) *C. bulleri*
    - d) *H. larincinus*
  5 In tannery effluent, —— together with—- are of major concern.
    - a) Cr, pentachlorophenol
    - b) Fe, trichloroethylene
    - c) Ni, sulphuric acid
    - d) Al, methyl acetate
  6 Which of the following organisms is useful in degrading naphthalene in petroleum wastes?
    - a) *Desulfobacterium cetonicum*
    - b) *Blastochloris sulfoviridis*
    - c) *Azoarcus tolulyticus*
    - d) *Thauera aromatica*
  7 Which statement best describes the wastewater due to the fermentation process in the Antibiotic industry?
    - a) Low levels of BOD, COD and TSS, pH of 6 to 8
    - b) High levels of BOD, COD and TSS, pH of 4 to 8
    - c) Low levels of BOD, COD and TSS, pH of 2 to 4
    - d) High levels of BOD, COD and TSS, pH of 2 to 4
  8 —— is the main carbohydrate in dairy wastewater.
    - a) Galactose
    - b) Lactose
    - c) Maltose
    - d) Sucrose
  9 Polishing pond helps to reduce TSS and ——
    - a) BOD
    - b) COD
    - c) pH
    - d) Temperature

Q.4 b. **Answer the following questions: (Any Two)** **14**
1. Discuss the secondary treatment for waste water from the pulp and paper industry.
2. Elaborate on biological treatment of antibiotic industry waste water.
3. Give an account of the impact of petroleum waste on the environment.

Q.5 **Write Short notes on the following: (Any Four)** **20**
a. Ethanol as biofuels.
b. Biosensors
c. Biostimulation and bioaugmentation
d. Packaged microorganisms
e. Characteristics of distillery wastewater
f. Tertiary treatment for dairy wastewater

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