NON-CONVENTIONAL ENERGY
(BIOT 4282)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) Which of the following has the potential to fulfil all our energy requirements?
(a) Nuclear energy (b) Wind energy
(c) Geothermal energy (d) Bioenergy

(ii) Which of the following is not a non-conventional energy?
(a) Tidal (b) Wave
(c) Wind (d) Gasoline

(iii) The electron have to overcome this type of energy to conduct electricity.
(a) Valence band energy (b) Conduction band energy
(c) Band gap energy (d) All of the above

(iv) Example of indirect-gain passive solar system is
(a) Heliostat (b) Trombe wall
(c) Parabolic trough collectors (d) None of the above

(v) Which of the following is not a biochemical process?
(a) Transesterification (b) Combustion
(c) Composting (d) Fermentation

(vi) A fuel cell is used to convert chemical energy into _____
(a) Mechanical energy (b) Solar energy
(c) Electrical energy (d) Potential energy

(vii) Which of the following is not a potential biofuel?
(a) Grassoline (b) Hydrogen Fuel Cells
(c) Algae Biodiesel (d) Bioethanol

(viii) The term biomass most often refers to _____
(a) Inorganic matter (b) Organic matter
(c) Chemicals (d) Ammonium compounds

(ix) Biodiesel is produced from oils or fats using
(a) fermentation (b) transesterification
(c) distillation (d) none of the above

(x) The bio ethanol is subjected to rectification to remove _____
(a) Sugar (b) Enzymes
(c) Yeast (d) Impurities

Group – B

2. (a) Why is direct production of electricity better that the other two methods of harnessing solar energy?

(b) How much collector area would a 1000MW solar farm require if the individual efficiencies of the collector system, turbine and generator are 45, 30 and 80% respectively?

5 + 7 = 12

3. (a) An offshore wind turbine with three 60m blades rotates at a leisurely 12 rpm. The wind is whipping along at 18m/s. What is the tip speed ratio for this turbine? How does this compare to the optimal tip speed ratio of this turbine?

(b) Write a short note on Darrieus wind turbine.

7 + 5 = 12

Group – C

4. (a) Illustrate and explain how ethyl alcohol can be produced by alcoholic fermentation?

(b) What happens if the process temperature is increased to 80˚C?

10 + 2 = 12

5. (a) What are the different sources of biomass that can be used to produce bioenergy?

(b) Write a note on biodiesel production.

6 + 6 = 12

Group – D

6. (a) What are the catalysts that are used for biodiesel production by trans-esterification.

(b) Write down the chemical reaction for trans-esterification using basic catalysts.

4 + 8 = 12

7. (a) Calculate the energy content of 1 m^3 of stoichiometric mixture of methane with air at 1 atmosphere pressure (101 KPa) and 298 K. LHV of methane is 50 MJ/kg.

(b) What are the sources and raw materials of biodiesel production?

9 + 3 = 12

Group – E

8. Write short note on
   (i) Alkaline electrolysis of water for hydrogen production
   (ii) Electrolysis of water in acid medium for hydrogen production .

(6 + 6) = 12

9. (a) Describe the steam reforming process of Hydrogen production.
   (b) Write short note on cryogenic storage of hydrogen.

6 + 6 = 12

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