

**NON-CONVENTIONAL ENERGY
(BIOT 4222)**

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

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

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Green house effect is an example of
 - (a) Indirect production of electricity
 - (b) Active solar system
 - (c) Passive solar system
 - (d) None of the above
- (ii) Which of the following is not a non-conventional energy
 - (a) Tidal
 - (b) Solar
 - (c) Wave
 - (d) Gasoline
- (iii) Planet Solar is a Swiss long-range experimental solar powered_____ project
 - (a) Aircraft
 - (b) Boat
 - (c) Bus
 - (d) Bicycle
- (iv) Which of the following is not a biochemical process
 - (a) Transesterification
 - (b) Composting
 - (c) Combustion
 - (d) Fermentation
- (v) The process of collecting volatile components and condensing them to produce bio-oil is called
 - (a) Pyrolysis
 - (b) Combustion
 - (c) Distillation
 - (d) Condensation
- (vi) The main pretreatment steps in production of bioethanol is
 - (a) Partial hydrolysis
 - (b) Liquefaction
 - (c) Saccharification
 - (d) All the above
- (vii) Which of the following is not a potential biofuel
 - (a) gasoline
 - (b) hydrogen fuel
 - (c) algae biodiesel
 - (d) none of these
- (viii) What is the by-product of biodiesel production
 - (a) salt
 - (b) methanol
 - (c) polymer
 - (d) glycerin

- (ix) During cracking of Natural gas, what is produced
 (a) Carbon (b) Hydrogen
 (c) Both C and H₂ (d) None of the mentioned
- (x) Which of the following does not affect the reactions in a fuel cell?
 (a) Electrolyte composition
 (b) Electrode composition
 (c) A combination of fuel and oxidiser
 (d) Catalytic effect of the reaction container

Fill in the blanks with the correct word

- (xi) _____ is an example of passive solar heating.
- (xii) A wind mill converts _____ energy of a wind to electrical energy.
- (xiii) The catalyst used in biodiesel formation is _____.
- (xiv) The full form of PEM membrane is _____.
- (xv) _____ is a type of geothermal energy that is generated by the heat of water and steam that is found deep underground.

Group - B

2. (a) Why is direct production of electricity better than the other two methods of harnessing solar energy? [[CO1](Analyse/IOCQ)]
- (b) How much collector area would a 800MW solar farm require if the individual efficiencies of the collector system, turbine and generator are 40, 25 and 80% respectively? [[CO1](Calculate/IOCQ)]
- 5 + 7 = 12**
3. (a) Illustrate the working principle of a wind mill. [[CO2](Illustrate/HOCQ)]
- (b) What are the different types of renewable energies? [[CO1](Remember/LOCQ)]
- (c) What are the limitations of the renewable energies? [[CO1](Remember/LOCQ)]
- 6 + 4 + 2 = 12**

Group - C

4. (a) Illustrate the production of bio-ethanol by alcoholic fermentation mentioning the operating conditions clearly. [[CO4](Analyse/HOCQ)]
- (b) Why is the operating temperature of bioethanol production kept within the given limit? [[CO4](Remember/LOCQ)]
- (c) When is pretreatment required for bioethanol production and why? [[CO4](Remember/LOCQ)]
- 7 + 2 + 3 = 12**
5. (a) What is bioenergy? Classify different sources of biomass from which bioenergy can be derived. [[CO3](Remember/LOCQ)]

- (b) Do you agree that waste biomass a better source of bioenergy? Justify your answer.

[[CO3](Apply/IOCQ)]

(2 + 7) + (1 + 2) = 12

Group - D

6. (a) Define the following:
(i) Cetane number
(ii) Specific gravity of fuel
(iii) Flash point
(iv) Fire point.

[[CO4](Remember/LOCQ)]

- (b) State the advantages of biodiesel compared to conventional diesel.

[[CO4](Remember/LOCQ)]

(4 × 2) + 4 = 12

7. (a) Name the method that is widely accepted for biodiesel formation. Write down the chemical reaction for that process.

[[CO5](Analyse/IOCQ)]

- (b) Name the catalysts used for trans-esterification reaction and explain which catalyst is better?

[[CO4](Analyse/IOCQ)]

6 + 6 = 12

Group - E

8. (a) State the advantages of hydrogen as renewable fuel.

[[CO6](Remember/IOCQ)]

- (b) Describe the process of partial oxidation method for hydrogen production.

[[CO6](Analyse/IOCQ)]

6 + 6 = 12

9. Describe the principle of hydrogen fuel storage by the following methods:

(i) Cryo-compressed storage

(ii) Metal hydrides.

[[CO6](Remember/LOCQ)]

(6 + 6) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	45.83	40.63	13.54

