

**RENEWABLE ENERGY TECHNOLOGY
(BIOT 4241)**

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 is an example of passive solar technology?
(a) Photovoltaic (b) Solar-furnace
(c) Active solar water heating systems (d) Solar thermo-mechanical systems.
 - (ii) Which of the following is used as fuel for transportation?
(a) Ethanol (b) Aldehyde
(c) Ketone (d) All of the above.
 - (iii) Which one of the following energy resources produces radioactive waste?
(a) Tidal (b) Nuclear (c) Wave (d) None of the above.
 - (iv) Non edible oils for biodiesel production are obtained from
(a) Soybean (b) Jatropha (c) Sunflower (d) Rapeseed
 - (v) Which Uranium isotope is used in nuclear power plants?
(a) U-235 (b) U-234 (c) U-236 (d) U-218.
 - (vi) Which transesterification reaction is most frequently used at all biodiesel production sites?
(a) Acidic (b) Basic (c) Neutral (d) Enzymatic.
 - (vii) Torrefaction is a part of which pyrolysis process
(a) Slow (b) Fast (c) Flash (d) All of these.
 - (viii) B5 indicates a blend with
(a) 5% biodiesel and 95% diesel fuel (b) 95% biodiesel and 5% diesel fuel
(c) 50% biodiesel and 50% diesel fuel (d) None of these.
 - (ix) Biogas is mainly composed of
(a) Carbon monoxide (b) Methane (c) Hydrogen (d) Nitrogen.

- (x) Biofuels obtained from algae are known as
(a) 1st Generation biofuels (b) 2nd Generation
(c) 3rd Generation biofuels (d) 4th Generation biofuels.

Group- B

2. (a) Analyze the 4th Generation biofuels. [(CO1)(Analyze/LOCQ)]
(b) Discuss the different methods of heat transfer to a pyrolysis reactor? [(CO1)(Discuss/IOCQ)]
(c) What is a Biohythane? Enumerate the advantages of Biohythane production. [(CO3)(Enumerate/IOCQ)]
3 + (1 + 4) + 4 = 12
3. (a) Write notes on Slow pyrolysis. [(CO1)(Remember/LOCQ)]
(b) What is a Bio-hydrogen? What are the advantages of biological routes of hydrogen production over non-biological routes? [(CO2)(Understand/LOCQ)]
(c) Illustrate the process of measuring the Ash in a Biomass? [(CO1)(Illustrate/IOCQ)]
4 + (1 + 3) + 4 = 12

Group - C

4. Design the process of Biodiesel production. [(CO2)(Design/HOCQ)]
12
5. Design the different processes of bioethanol production from corn? [(CO3)(Design/HOCQ)]
12

Group - D

6. (a) What is photovoltaic effect? Explain the use of semi-conductors in photovoltaic cells. [(CO5)(Understanding/LOCQ)]
(b) Why doping is necessary for semi-conductors? [(CO5)(Understanding/LOCQ)]
(c) Distinguish between solar cells, arrays and modules. [(CO5)(Analyze/IOCQ)]
4 + 4 + 4 = 12
7. (a) Describe the working principle of nuclear reactor? [(CO6)(Describe/IOCQ)]
(b) Design the mechanism behind working of a fuel cell. [(CO5)(Design/IOCQ)]
(c) Decipher with the help of a diagram how methane gas can be used as a fuel. [(CO6)(Evaluate/IOCQ)]
4 + 4 + 4 = 12

Group - E

8. (a) Discuss in detail how geothermal energy can be used directly in terms of heat and electricity purposes. [(CO6)(Discuss/IOCQ)]

- (b) Distinguish between flash and binary cycle plants. [(CO6)(Distinguish /IOCQ)]
(c) Explain the difference between nuclear fission and nuclear fusion. Why hasn't nuclear fusion being used as a source of renewable energy alternative.
[(CO6)(Analyse/HOCQ)]
4 + 4 + 4 = 12

9. (a) Distinguish between the working principle of first and second generation tidal power plants. [(CO6) (Analyze/IOCQ)]
(b) Analyze the various working principles of wave power designs.
[(CO6) (Analyze/IOCQ)]
6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	19.79	51.04	29.17

Course Outcome (CO):

After the completion of the course students will be able to

1. Distinguish the different types of biomass and explain its uses.
2. Explain the conversion of biomass to clean fuels and also conversion of petrochemical substitutes to useful products by physiochemical/fermentation processes.
3. Explain how ethanol and methane can be produced from biomass to produce bio-ethanol.
4. Describe how biopolymer and biosurfactants can be used for microbial recovery of petroleum.
5. Describe and understand how solar energy can be harnessed for useful purposes such as production of photovoltaic cells and for chemical storage purposes.
6. Analyze and understand how other renewable energy sources can be harnessed for other productive purposes.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

