SPECIAL SUPPLE B.TECH/CE/ECE/EE/8TH SEM/BIOT 4282/2018

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) The process of collecting volatile components and condensing them to produce bio-oil is called
(a) pyrolysis (b) combustion
(c) distillation (d) condensation.

(ii) The principal organism for alcoholic fermentation is
(a) Saccharomyces cerevisiae (b) Aspergillus niger
(c) Eschericia coli (d) Penicillium notatum.

(iii) A biogas can have the following composition:
(a) Methane- 45%, CO_2-45%, N_2- 8%, H_2S- 1.5%, H_2- 0.5%
(b) Methane- 65%, CO_2-25%, N_2- 8%, H_2S- 1.5%, H_2- 0.5%
(c) Methane- 25%, CO_2-65%, N_2- 8%, H_2S- 1.5%, H_2- 0.5%
(d) Methane- 50%, CO_2-50%, N_2- 8%, H_2S- 1.5%, H_2- 0.5%

(iv) 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.

(v) Which of the following is not an example of non-conventional energy?
(a) nuclear energy (b) solar energy
(c) gasoline (d) geothermal energy.

(vi) A fuel cell is used to convert chemical energy into
(a) mechanical energy (b) solar energy
(c) electrical energy (d) potential energy.

(vii) Select the incorrect statement from the following option
(a) Fuel cells have high efficiency
(b) The emission levels of fuel cells are far below the permissible limits
(c) Fuel cells are modular
(d) The noise levels of fuel cells are high.

(viii) What chemical reaction makes biodiesel?
(a) Fermentation (b) Sublimation
(c) Polymerisation (d) Trans-esterification.

(ix) Pure biodiesel does not emit which of the following pollutants?
(a) Nitrogen di oxide (b) Sulphur di oxide
(c) Particulate matter (d) Carbon monoxide.

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

Group - B

2. (a) What do you understand by the term "non-conventional energy"? What are the different forms of non-conventional energy?

(b) A home in Phoenix requires 85kWh of heat on a winter day to maintain a constant indoor temperature of 20°C. The average solar radiation in winter is 6.5kWh/m^2.day. The average temperature of the hot fluid be 60°C.
(i) How much collector surface area does it need for an all solar heating system that has 50% efficiency?
(ii) What should be the capacity of the storage tank to provide the required energy?

(2 + 2) + (4 + 4) = 12

3. (a) What is a photovoltaic cell?

(b) Explain the working of a photovoltaic cell.

(c) Why is it important to know tip speed ratio of a wind turbine?

(d) If you have a wind turbine with three blades, each 4m long, what distance does the tip of each blade travel in one full revolution?

2 + 5 + 2 + 3 = 12

Group - C

4. What are the different processes by which biogas can be produced? Explain any one in detail.

2 + 10 = 12

5. (a) What is silviculture? What are the different types of silviculture practised? Which type of silviculture is best for production of bioenergy and why?

(b) Describe the process of production of ethanol by alcoholic fermentation.

(1 + 3 + 2) + 6 = 12

Group - D

6. (a) Define the following parameters related to transport fuel quality :
(i) Octane number (ii) Cetane number (iii) HHV.

(b) Write down the process and chemical reaction of trans-esterification for biodiesel production.

(2 + 2 + 2) + 6 = 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 of biodiesel formation?

8 + 4 = 12

Group - E

8. What is fuel cell? What are the uses of fuel cell? Name two organisms which can produce bio-hydrogen.

(6 + 4) + 2=12

9. (a) Describe the steam reforming process of Hydrogen production.

(b) Write short note on cryogenic storage of hydrogen.

6 + 6 = 12