CS/B.Tech/(EE-NEW)/SEM-7/EE-704D/2013-14
2013
RENEWABLE & NON-CONVENTIONAL ENERGY

Time Allotted : 3 Hours | *Full Marks* : 70

The figures in the margin indicate full marks.

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

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) The standard value for solar constant as per NASA standard is

a) 1150 W/m^2 b) 1353 W/m^2

c) 2100 W/m^2 d) 1825 W/m^2 .

ii) Which of the following is not a renewable energy source ?

a) Hydropower b) Tidal power

c) Geothermal d) Fuel cell.

iii) An illuminated solar cell is

a) constant voltage device

b) constant current device

c) constant power output device

d) none of these.

iv) Photo-voltaic cell is basically a/an

a) *p-n* junction

b) photo-transistor

c) amorphous *p-n* junction

d) none of these.

v) In a solar panel, the metal used is

a) gold b) copper

c) silver d) nickel.

vi) The greenhouse gas is

a) carbon dioxide b) methane

c) nitrous oxide d) all of these.

vii) Bio-gas is produced by a particular type of bacterial digestion. The digestion process is called

a) normal digestion b) aerobic digestion

c) anaerobic digestion d) none of these.

viii) Bio-gas consists of

a) only methane

b) methane and carbon dioxide

c) only ethane

d) all of these

e) none of these.

ix) Geothermal energy field is available mainly in which of the following areas ?

a) Hilly b) Volcanic

c) Offshore d) Desert.

x) A geothermal field may yield

a) dry steam b) wet steam

c) hot air d) all of these.

xi) The turbine normally employed in tidal power is

a) simple impulse type b) propeller type

c) reaction type d) reversible type.

xii) MHD utilizes

a) direct conversion of heat to electricity

b) conversion of heat to steam

c) conversion of heat to force

d) none of these.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. How economic are the non-conventional sources with respect to the conventional energy sources ? Considering that, how would you rate the future of non-conventional energy sources ?

3. Explain the types of generators used with wind turbines for producing electricity.

4. What are the main advantages and disadvantages of bio-mass energy ? Explain the process of photosynthesis. 3 + 2

5. a) What is tidal power generating system ? 2

   b) Discuss the advantage and limitation of tidal power generation. 3

6. a) What are the different types of fuel cell ? 2

   b) State the advantages and limitations of fuel cells. 3

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Explain beam and diffuse radiation.

   b) Calculate the angle made by beam radiation with the normal to a flat collector on 21st October at 9 : 00 AM. solar time for a location at 18° 35′ N. The collector is tilted at an angle of latitude plus 10°, with the horizontal and is pointing due South.

   c) Calculate the sun-set hour angle and day length at a location latitude of 35°N. on March 14. 5 + 5 + 5

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8. a) What are photo-voltaic device ?

   b) Outline briefly the principle of operation of a photo-voltaic device.

   c) Describe the different types of solar energy collectors in common use along with diagram. 2 + 5 + 8

9. a) What is the basic principle of wind energy conversion ?

   b) Derive the expression for power development due to wind.

   c) A propeller wind turbine has a diameter of 120 m and runs at 1 standard atmosphere and 18°C has a velocity of 15 m/s. Calculate

      i) the total power density in the wind stream

      ii) the total power

      iii) the torque and the thrust. 5 + 5 + 5

10. What is meant by geo-thermal energy ? By what methods is this energy extracted ? What are the difficulties and disadvantages of a geo-thermal generation ? What are the possible sources of geo-thermal pollution ? How are these avoided ? 2 + 2 + 4 + 4 + 3

11. Write short notes on any *three* of the following : 3 × 5

    a) NCES potential : Indian point of view

    b) Local solar time

    c) Electro-chemical energy storage

    d) Magnus effect

    e) Hydro-thermal resources.