Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (EE-NEW)/SEM-7/EE-704E/2010-11

2010-11

NON-CONVENTIONAL ENERGY SOURCES

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 × 1 = 10

i) Photo-voltaic cell is basically a

a) *p-n* junction

b) photo-transistor

c) Amorphous *p-n* junction

d) none of these.

ii) Which is not renewable energy source ?

a) hydropower b) tidal power

c) geothermal d) fuel cell.

iii) Which process is responsible for production of energy in the sun ?

a) Nuclear fission b) Nuclear fusion

c) Exothermal reaction d) All of these.

iv) A solar cell is basically a/an

a) voltage source

b) current source

c) uncontrolled current source

d) uncontrolled voltage source.

v) Wave energy is basically harnessed in the form of

a) Thermal energy b) Chemical energy

c) Mechanical energy d) Electrical energy.

vi) Bright sunlight provides luminance of approximately

a) 10,000 candel/sq. m

b) 1,000 candel/sq. m

c) 1,00,000 candel/sq. m

d) 10,00,000 candel/sq. m.

vii) The solar constant measured by satellites is approximately

a) 1366 W/m^2 b) 1412 W/m^2

c) 1321 W/m^2 d) None of these.

viii) The output of a solar cell is of the order of

a) 0·5 W b) 1·5 W

c) 5·0 W d) 7·5 W.

ix) Energy band gap monocrystalline silicon cell is

a) 0·6 eV b) 2·2 eV

c) 1·8 eV d) 1·12 eV.

x) India receives an annual intensity of solar radiation between

a) 16700 – 29260 $J/m^2/day$

b) 16700 – 29260 $kJ/m^2/day$

c) 16700 – 29260 J/m/day

d) 16700 – 29260 kJ/day.

xi) MHD utilizes

a) direct conversion of heat to electricity

b) conversion of heat to steam

c) conversion of heat of force

d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Explain in brief the auxiliaries of a micro-hydropower plant. 5

3. Explain in brief : $2\frac{1}{2} + 2\frac{1}{2}$

a) Downdraft type biomass gasification plant

b) Updraft type biomass gasification plant.

4. a) Draw a simplified diagram to show the structure of hydrothermal resource.

b) Briefly describe the available hydrothermal resources.

1 + 4

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

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

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

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

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. What are the advantages and disadvantages of Bio-diesel over the conventional mineral Diesel oil ? Explain with example. 15

8. a) List and briefly discuss the factors that you would take into consideration in selecting a site of a land-based wind machine.

   b) Wind turbine units are rated at 2 MW in a rated wind speed of 13 m/s. There slate efficiencies are $C_p = 0{\cdot}32$, $\eta_{gb} = 0{\cdot}94$, $\eta_g = 0{\cdot}94$. What is the necessary swept area ? If the rotor is a two-blade propeller (horizontal axis), what is the rotor diameter ? ($\rho = 1{\cdot}29$ kg/m^3). 8 + 7

9. a) Explain and deduce the effect of combination of a pumped storage facility with a total barrage scheme. What assumption is to be made to gain maximum benefit from the pump storage addition ?

   b) What is the extractable power from a deep-sea wave of wavelength 150 m and height 1·5 m if $g = 9{\cdot}8$ m/s^2 ? 9 + 6

10. a) Why does water in geothermal aquifers remain in the liquid state even though its temperature may be much higher than 100° C

    b) A geothermal aquifer supplies hot water with a well-head temperature of 75° C at the flow rate of 20 litres/s. The heat energy is used to supplement a district heating unit above datum temperature of 40° C. If the geothermal heat is used for 170 days each year, how much oil is saved annually if the overall combustion efficiency of the oil burner is 75% ?

    (1 ton of oil = 10×10^9 cals). 8 + 7

11. Discuss briefly the types of biogas plant. How Bio-energy may be useful for rural application. Justify your answer. 9 + 6