

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/m²/day
 - b) 16700 – 29260 kJ/m²/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 × 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. 8 + 7
- b) Wind turbine units are rated at 2 MW in a rated wind speed of 13 m/s. Their stage efficiencies are $C_p = 0.32$, $\eta_{gb} = 0.94$, $\eta_g = 0.94$. What is the necessary swept area ? If the rotor is a two-blade propeller (horizontal axis), what is the rotor diameter ? ($\rho = 1.29 \text{ kg/m}^3$). 9 + 6
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 ? 8 + 7
- b) What is the extractable power from a deep-sea wave of wavelength 150 m and height 1.5 m if $g = 9.8 \text{ m/s}^2$? 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 ? 8 + 7
- 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% ? 8 + 7
- (1 ton of oil = 10×10^9 cal).
11. Discuss briefly the types of biogas plant. How Bio-energy may be useful for rural application. Justify your answer. 9 + 6