



Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech(EE)/SEM-7/EE-704E/2011-12

2011

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 :

$$10 \times 1 = 10$$

- i) Which process is responsible for production of energy in the sun ?
 - a) Nuclear fission reaction
 - b) Nuclear fusion reaction
 - c) Exothermal chemical reaction
 - d) All of these.
- ii) Global warming is mainly caused due to
 - a) emission of heat from engine
 - b) emission of CO₂ due to burning of fossil fuels
 - c) use of nuclear enegy
 - d) air pollution.



- iii) A solar cell is basically
- a) a voltage source controlled by flux of radiation
 - b) a current source controlled by flux of radiation
 - c) an uncontrolled current source
 - d) an uncontrolled voltage source.
- iv) If three blades of a propeller type wind turbine are too close to each other
- a) the blades will break
 - b) the blades will stall
 - c) the succeeding blade will move due to turbulence created by the preceding blade
 - d) the preceding blade will move due to turbulence created by the succeeding blade.
- v) The turbine used in a tidal range plant is a
- a) Pelton turbine
 - b) Kaplan turbine with variable pitch blades
 - c) Kaplan turbine with fixed pitch blades
 - d) Francis turbine.



- vi) Wave energy is basically harnessed in the form of
- a) thermal energy
 - b) chemical energy
 - c) mechanical energy
 - d) electrical energy.
- vii) The hydrothermal resources are located at shallow to moderate depths from
- a) 100 m to 4,500 m
 - b) 150 m to 6,000 m
 - c) 120 m to 3000 m
 - d) 200 m to 9,000 m.
- viii) Solar photo-voltaic panel consists of photo-voltaic cells connected in
- a) series
 - b) parallel
 - c) series parallel
 - d) none of these.



ix) Which of the following is not renewable energy source ?

- a) Hydropower b) Tidal power
- c) Geothermal power d) Fuel cell.

x) Fill factor indicates the

- a) solar radiation
- b) energy of solar cell
- c) quality of solar cell
- d) none of these.

xi) The standard value of solar constant is

- a) 1150 W/m^2 b) 1367 W/m^2
- c) 2100 W/m^2 d) 1825 W/m^2 .

GROUP – B

(Short Answer Type Questions)

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

2. What are the advantages of an Evacuated tube solar water heater over a Flat plate collector type solar water heater having the same capacity ?



3. How economic are the non-conventional sources with respect to the conventional energy sources ? Considering that, how do you rate the future of non-conventional energy source ?
4. a) Describe a single crystalline solar cell with constructional details. 3
- b) What is 'fill factor' of a PV cell ? 2
5. a) What is Geo-thermal energy ? 3
- b) By what method is this energy extracted ? 2
6. a) How is the power output related to wind speed ? 3
- b) What type of generators are coupled to wind turbines ? 2

GROUP – C

(Long Answer Type Questions)

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

7. What are the different components of environment ? What environmental hazards are created by the conventional power plants ? Explain the importance of non-conventional energy sources in the context of global warmkng. $3 + 5 + 7$

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8. a) What is a fuel cell ? What are potential applications of a fuel cell ?

b) Explain the principle and constructional details of a hydrogen fuel cell. (3 + 4) + 8

9. a) Draw the equivalent circuit of a practical solar cell and describe its I-V characteristics. Also give a brief idea about the effect of variation of insolation and temperature.

b) Describe briefly the following :

i) Stand alone solar PV system

ii) Grid interconnected solar PV system.

4 + 3 + 4 + 4

10. a) Derive the expression of total energy content of hot dry rock resource.

b) i) Explain single basin, single effect tidal energy conversion scheme.



- ii) A single basin type tidal power plant has a basin area of 2km^2 . The tide has an average range of 13 m. Power is generated only during the ebb cycle. The turbine stops operating when the head on it falls below 3 m. Calculate the average power generated by the plant in single emptying process of the basin if the turbine generator efficiency is 0.7. Estimate the average energy generation of the plant.

5 + 5 + 5

11. Explain the working principle of MHD energy conversion.

