

Roll No. : .....

Invigilator's Signature : .....

**CS/B.TECH (EE)/SEM-7/EE-704E/2012-13**

**2012**

**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 the following :  $10 \times 1 = 10$

i) The standard value for solar constant is

- a)  $1150 \text{ W/m}^2$       b)  $1367 \text{ W/m}^2$   
c)  $2100 \text{ W/m}^2$       d)  $1825 \text{ W/m}^2$ .

ii) The greenhouse gas is

- a) carbon dioxide      b) methane  
c) nitrous oxide      d) all of these.

iii) Which is not renewable energy source ?

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

iv) Temperature of inner core of earth is

- a) 1000 degree Celsius  
b) 4000 degree Celsius  
c) 40000 degree Celsius  
d) 500 degree Celsius.

v) Capacity of a micro hydel power plant is

- a) up to 100 kW      b) 101 to 1000 kW  
c) 1 to 25 MW      d) 100 MW.

vi) Main components of a concentrating type solar collector is

- a) reflecting mirrors      b) refracting lenses  
c) both (a) and (b)      d) none of these.

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

- a) Nuclear fission      b) Nuclear fusion  
c) Exothermal reaction      d) None of these.

viii) PV cell is basically

- a) *p-n* junction  
b) photo transistor  
c) amorphous *p-n* junction  
d) none of these.

ix) Wave energy is basically harnessed as

- a) thermal energy      b) chemical energy  
c) electrical energy      d) mechanical energy.

x) 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  $3 \times 5 = 15$

2. Write down the basic operating principle of a solar cell with proper diagram.
3. Draw a neat diagram and label the different parts of a wind turbine.
4. Define Fill factor. Write down the major limitations of solar energy.  $1 + 4$
5. Draw the following :
  - a) Power *vs* speed characteristics of a wind turbine.
  - b) Block diagram depicting ethanol production from sugarcane.  $3 + 2$
6. What is the economics and future prospect of tidal energy ?

**GROUP – C**

**( Long Answer Type Questions )**

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

7. a) Briefly describe manufacturing process of commercial Multicrystalline Silicon cell. Highlight the steps taken in manufacturing the minimize wastage of material.
- b) A house has a power requirement of 400 W for 4 hours every night. A PV array made up of modules with single crystalline silicon cells, a battery storage system and inverter is to be designed for this load. It is also to be taken care that one night's requirement will have to be taken care even if there is no sunshine in the day. Calculate number of PV modules and batteries required. Given (i) Solar radiation is available for average 6 hours daily and average global radiation flux incident on array is 650 W/M sq. (ii) Battery rating 12V, 120AH, depth of discharge = 0.7, charging and discharging efficiency = 0.9, (iii) Inverter efficiency at full load = 0.85, (iv) Module size = 1.191 M × 0.533 M.

8. What are the advantages and disadvantages of Bio-diesel over the conventional mineral diesel oil ? Explain with example.
9. What is fuel cell ? Discuss different types of fuel cell. What are the advantages of fuel cell energy ? Discuss on alkaline fuel cell and hydrogen fuel cell.  $2 + 3 + 3 + 3 + 4$
10. a) List and briefly discuss the factors that you would take into consideration in selecting a site of a land-based wind machine.
- b) Describe different types of Wind Turbines with neat sketches.  $8 + 7$
11. Write short notes on any *three* of the following :  $3 \times 5$ 
  - a) Magneto hydrodynamic energy conversion
  - b) Microhydel generation
  - c) Advantages of non-conventional sources over conventional sources
  - d) Biodiesel
  - e) Wave energy.

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