Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (EE)/SEP.SUPPLE/SEM-7/EE-704E/2012

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 any *ten* of the following : $10 \times 1 = 10$

i) Dolphin Mechanism is for extracting

a) solar energy b) ocean energy

c) wind energy d) geothermal energy.

ii) Which of the following is not renewable energy ?

a) Tidal energy b) Fuel cell

c) Geothermal energy d) Solar energy.

iii) Types of geothermal fluids used as input to power plants are

a) hot water b) cold water

c) sea water d) vapour.

iv) For a solar PV cell dark current is because of
   a) minority particles b) majority particles
   c) gamma particles d) stream aquifers.

v) Tidal power plants are built on
   a) seashore b) creeks
   c) plates d) mountain range.

vi) Green house gas is
   a) methane b) carbon dioxide
   c) hydrogen d) oxygen.

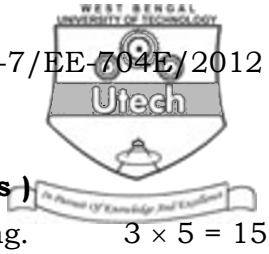
vii) The angle made by the line joining the centre of the sun and the earth with its projection on the equatorial plane is
   a) declination angle b) zenith angle
   c) solar azimuth angle d) hour angle.

viii) Calorific value of biogas ranges between
   a) 3000-3500 kcal/kg b) 2000-4000 kcal/kg
   c) 1000-2500 kcal/kg d) 5000-5500 kcal/kg.

ix) The main component of biogas is
   a) methane gas b) nitrogen gas
   c) carbon dioxide gas d) oxygen gas.

x) The variation of solar cell voltage with insolation is
   a) linear b) constant
   c) exponential d) logarithmic.

xi) A solar cell is basically
   a) voltage source
   b) current source
   c) uncontrolled current source
   d) uncontrolled voltage source.



GROUP – B

(Short Answer Type Questions)

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

2. What is meant by renewable energy source ? What are the differences between conventional and non-conventional energy sources ?
3. Define solar constant. What do you mean by global radiation ? Explain with a neat sketch the solar radiation received at the earth's surface including the mechanism of absorption and scattering.
4. Write advantages and disadvantages of a tidal barrage scheme.
5. a) What is Geothermal power ?
   b) State various precautions to be observed during operation of Geothermal plant. 2 + 3
6. a) Using Betz model of a wind turbine, derive the expression for power extracted from wind.
   b) What is the maximum theoretical power that can be extracted and under what condition ? 3 + 2

GROUP – C

(Long Answer Type Questions)

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

7. a) What is a fuel cell ? With the help of a neat diagram describe the construction and operation of an alkaline fuel cell.
   b) Classify fuel cells and describe the advantages of fuel cell. (2 + 7) + (3 + 3)

8. a) Explain the principle of operation of Horizontal Axis Wind Turbine (HAWT) with the help of a neat diagram.

   b) Derive the relation between extracted wind power and unperturbed wind speed by Betz model.

   c) What is understood by pitch angle ? 7 + 6 + 2

9. a) Describe a silicon solar cell along with its constructional features and the equivalent circuit.

   b) What is hot spot effect ? Mention the precaution for it.

   c) Explain maximum power point traking mechanism of a PV system. 6 + 4 + 5

10. a) Classify different types of solar thermal collectors.

    b) Show the constructional details of a flat plate collector with a diagram.

    c) Draw the schematic diagram of a solar-thermal power generation plant using helliostat. 5 + 5 + 5

11. Write short notes on any *three* of the following : $3 \times 5 = 15$

    a) Solar pond power plant

    b) Biomass for generation of electricity

    c) Closed cycle MHD system of power generation

    d) Tidal wave and OTEC for electric generation.

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