MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EE-704D

RENEWABLE AND NON-CONVENTIONAL ENERGY

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) Power available in wind is proportional to
      a) wind speed
      b) square of the wind speed
      c) cube of the wind speed
      d) fourth power of the wind speed.

   ii) The output of a solar cell is of the order of
      a) 0·5 W b) 1·0 W
      c) 5·0 W d) 10·0 W.

   iii) Most of potential exploitable geothermal heat is store in
      a) water b) dry rock
      c) air d) steam aquifers.

   iv) For a polar PV cell dark current is because of
      a) minority carriers b) majority carriers
      c) both (a) and (b) d) none of these.

   v) Harmful nuclear radiation includes
      a) Alpha particles b) Beta particles
      c) Gamma particles d) All of these.

   vi) Fill factor indicates the
      a) solar radiation b) energy of solar cell
      c) quality of solar cell d) none of these.

   vii) Which of the following is not a renewable energy source ?
      a) Hydropower b) Tidal power
      c) Fuel cell d) Geothermal.

   viii) The Greenhouse gas is
      a) carbon dioxide b) methane
      c) nitrous oxide d) all of these.

   ix) MHD utilizes
      a) Direct conversion of heat to electricity
      b) Conversion of heat to stream
      c) Conversion of heat to force
      d) None of these.

   x) Photo-voltaic cell is basically a/an
      a) *p-n* junction
      b) photo transistor
      c) amorphous *p-n* junction
      d) none of these.

   xi) Horizontal axis windmills of modern design can
      a) always turn towards the direction of the wind
      b) never adjust the energy output
      c) never turn toward the direction of the wind
      d) none of these.

xii) The turbine normally employed in tidal power is
   a) Simple impulse type
   b) Propeller type
   c) Reaction type
   d) Reversible type.

GROUP – B

(Short Answer Type Questions)

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

2. Explain the type of generators used with the wind turbines for producing electricity.
3. a) What is tidal power generating system ?
   b) Discuss the advantage and limitation of tidal power generation. 2 + 3
4. a) What are the different types of fuel cell ?
   b) State the advantages and limitations of fuel cell. 2 + 3
5. Discuss solar water heating system with antifreeze with a neat sketch.
6. a) What is geothermal energy ?
   b) By what method is this energy extracted ? 2 + 3

GROUP – C

(Long Answer Type Questions)

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

7. a) What is *PV* cell ? What is 'fill factor' of a PV cell ?
   b) 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.
   c) Describe a single crystalline solar cell with constructional details. (2 + 2) + (3 + 4) + 4

8. a) Explain single basin, single effect tidal energy conversion scheme.
   b) A single basin type tidal power plant has a basin area of 2 km^2. The tide has an average 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.
   c) Discuss the advantage and limitation of tidal power generation. 5 + 5 + 5
9. a) Describe the basic principle of operation of an MHD generator. Derive expression of maximum power generation per unit volume of generator.
   b) With the help of schematic diagram explain the operation of closed cycle MHD generating system. (3 + 4) + 8
10. a) Explain the combustion reaction process.
   b) Briefly discuss the differences in combustion and electrochemical reaction in a fuel cell.
   c) List five types of fuel cells.
   d) Describe a hydrogen-oxygen fuel cell with a sketch showing reaction. 2 + 3 + 6 + 4
11. a) What are the different types of geothermal resources ?
   b) What are the major applications of geothermal energy ?
   c) What principles guide in the location of a geothermal power station ?
   d) What is the prospect of geothermal energy ? 3 + 2 + 5 + 5