

CS/B.Tech/ECE/Even/Sem-8th/EC-802C/2015



WEST BENGAL UNIVERSITY OF TECHNOLOGY

EC-802C

RENEWABLE ENERGY (EE)

Time Allotted: 3 Hours

Full Marks: 70

*The questions are of equal value.
The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.
All symbols are of usual significance.*

GROUP A
(Multiple Choice Type Questions)

10 × 1 = 10

1. Answer *all* questions.
 - (i) Global warming is mainly caused due to
 - (A) Emission of heat from engines
 - (B) Emission of CO₂ due burning of fossil fuels
 - (C) Use of nuclear energy
 - (D) Air pollution
 - (ii) Recycling of waste
 - (A) Encourages production of second grade product
 - (B) Conserves both material and energy
 - (C) Causes environmental pollution
 - (D) Consumes more energy as compared to manufacturing from fresh material
 - (iii) Which type of Generator is employed in wind power plant?
 - (A) Synchronous generator
 - (B) Induction generator
 - (C) Permanent magnet motor
 - (D) Brushless motor

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- (iv) A group of solar collectors connected together is called a
 - (A) Solar cell
 - (B) Solar array
 - (C) Solar centre
 - (D) Solar concentrator
- (v) Why is energy storage required?
 - (A) To match supply and demand in time domain
 - (B) To conserve energy
 - (C) To increase energy consumption
 - (D) To supply energy for many years to come
- (vi) Energy loss of the flywheel is reduced by
 - (A) Reducing its diameter
 - (B) Reducing its inertia
 - (C) Putting the flywheel in a sealed vacuum chamber and by providing magnetically levitated bearings
 - (D) Increasing its speed
- (vii) The energy flux in waves is
 - (A) less than that in wind energy
 - (B) more than that in wind energy
 - (C) comparable to that in wind energy
 - (D) more than that in wind energy but less than solar energy
- (viii) The use of pelton wheel is desirable for the conditions of
 - (A) high head and low discharge
 - (B) low head and high discharge
 - (C) high head and high discharge
 - (D) low head and low discharge
- (ix) In a Fuel cell which energy converts into electrical energy?
 - (A) Chemical
 - (B) Kinetic
 - (C) Mechanical
 - (D) Radioactive
- (x) For a high temperature range which fuel cell we generally use?
 - (A) Solid oxide
 - (B) Hydrogen-oxygen
 - (C) Molten carbonet salts
 - (D) Fossil fuel cell

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GROUP B
(Short Answer Type Questions)

- Answer any *three* questions. 3×5 = 15
2. Why we use hydel power generation and what do you mean by micro hydel generation? 5
 3. What are the basic instruments use in tidal power generation and also write the advantages of tidal power generation. 5
 4. Calculate the open-circuit voltage and maximum power output for a magneto hydrodynamic generator having the following data:
Plate area = 0.25 m², Distance between the electrodes = 0.5 m,
Flux density = 1.8 Wb/m², Average gas velocity = 1200 m/s, Gaseous conductivity = 10 mho/m. 5
 5. What is a solar collector? Name different types of solar collectors. What are the materials used to make a solar collector. 5
 6. What are the different types of fuel cells? State the advantages and limitations of fuel cells. 5

GROUP C
(Long Answer Type Questions)

- Answer any *three* questions. 3×5 = 15
7. What is meant by geo-thermal energy? By what methods this energy is extracted? What are the difficulties and disadvantages of a geo-thermal generation? What are the possible sources of geo-thermal pollution? How are these avoided? 2+2+4+3 = 11
 8. (a) Give a brief description of Municipal Solid Waste (MSW) Incineration Plant. 5+5+3+2 = 15

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- (b) Calculate the volume of a fixed dome type biogas digester for the output of two cows. Also, calculate the thermal power available from biogas. Use the following data:

Retention time = 40 days
Dry matter produced = 2kg/day/cow
Biogas yield = 0.22 m³/kg of dry matter
Percentage of dry matter in cow dung = 18%
Density of slurry = 1090kg/m³
Burner efficiency = 60%
Heating value of biogas = 23MJ/m³.

- (c) What are the advantages and disadvantages of biomass energy?

9. (a) What is fuel cell? Describe the main advantages of fuel cell. (2+5)+6+2 = 15
- (b) Explain the principle of operation of Alkaline fuel.
- (c) Draw the V-I Characteristic of fuel cell.
10. (a) What is the basic principle of wind energy conversion? 3+7+5 = 15
- (b) Derive the expression for power development due to wind.
- (c) A propeller-type wind turbine has the following data:
Speed of free wind at a height of 10 m = 12 m/s, Air density = 1.226 kg/m³,
 $\alpha = 0.14$, Height of tower = 100 m, Diameter of rotor = 80 m, Wind velocity at the turbine reduces by 20%, Generator efficiency = 85%.
Find:
(i) Total power available in wind
(ii) Power extracted by the turbine
(iii) Electrical power generated
(iv) Axial thrust on the turbine and
(v) Maximum axial thrust on the turbine.
11. (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 insulation and temperature. 4+3 = 7
- (b) Describe briefly the following: 4+4 = 8
(i) Stand alone solar PV system
(ii) Grid interconnected solar PV system.

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