ENERGY RESOURCES
(REEN 5101)

Time Allotted: 3 hrs **Full Marks: 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and Any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1=10**

(i) The earth becomes very hot in the summer due to
(a) heat coming from the sun by convection to the earth
(b) heat coming from the sun by radiation to the earth
(c) entire visible spectrum of light coming from the sun to the earth
(d) UV radiation coming from the sun to the earth.

(ii) Which of the following source of energy is non-renewable in category?
(a) geothermal energy
(b) atomic energy from Plutonium
(c) solar energy
(d) biomass.

(iii) The collection efficiency of Flat plate collector can be improved by
(a) putting the selective coating on the surface
(b) evacuating the space above the absorber plate
(c) putting a glass top over the surface
(d) none of the above.

(iv) Solar energy can be stored in the form of
(a) thermal energy (b) light energy
(c) mechanical energy (d) magnetic energy.

(v) In a hydro power plant
(a) potential energy possessed by stored water is converted into electricity.
(b) kinetic energy possessed by stored water is converted into potential energy.
(c) electricity is extracted from water.
(d) water is converted into steam to produce electricity.

(vi) The power from the sun intercepted by the earth is approximately
(a) $1.8x10^{8}$W (b) $1.8x10^{11}$W (c)$1.8x10^{14}$W (d)$1.8x10^{17}$W.

(vii) Biomass is the product of
(a) decomposed animal bodies
(b) decomposition products of agricultural wastes
(c) small segments of trees & plants
(d) fermentation of fruits & vegetables.

(viii) Green-house gas emission per unit of power is minimum for which of following power generation process?
(a) Biogas power plant
(b) Atomic Power plant
(c) Thermal Power plant
(d) Diesel Power generation units.

(ix) Biodiesel can be produced by
(a) trans esterification of vegitable oils
(b) Esterification of fatty acids
(c) hydrolysis of vegitable oils
(d) none of these .

(x) Approximately how many people in the world use geothermal energy?
(a) 500000 (b) 20 million (c) 60 million (d)1 billion.

Group - B

2 (a) Derive Bernoulli's equation with due assumptions and considerations involved.

(b) What is a sustainable energy resource?

(c) Explain the green house effects on environment due to the use of non-renewable energy.

5 + 2 + 5 = 12

3 (a) Describe the different mode of heat transfer. State Stephen Boltzmann Law of radiation.

(b) State the advantages of counter flow arrangement over parallel flow arrangement. When would you prefer parallel flow? Under what condition parallel flow and counter flow arrangement become equally efficient?

(4 + 2) + (4 + 2) = 12

Group - C

4. (a) What do you mean by stand alone and building integrated system for supply of power using photovoltaic cell?

   (b) What is the basic principle of photovoltaic cell? Explain with a schematic diagram.

6 + 6 = 12

5 (a) Explain the working of solar water heater with schematic diagram. Explain the mechanism of self cleaning solar cell.

   (b) How does a solar cell differ from batteries?

(6 + 4) + 2 = 12

Group - D

6 (a) What are the key differences in the requirements for a wind pump for irrigation and a wind pump for water supply?

   (b) What is bio-gas? Describe the working of anaerobic digester with a schematic diagram.

5 + (5 + 2) = 12

7 (a) Classify different water turbines and explain the working principle and function of impulse turbine.

   (b) What are the basic requirements for constructing a Hydel Power plant including equipments & water requirement?

6 + 6 = 12

Group - E

8 (a) What is geothermal energy? What is a Geothermal Heat Pump?

   (b) Describe the Geothermal energy scenario in India.

   (c) Describe the source of thermal energy termed as Geothermal Energy inside the earth's surface.

(2 + 2) + 4 + 4 = 12

9 (a) Explain the existence of other types renewable sources of energy and how would they be made viable & feasible for power generation?

   (b) Make a comprehensive cost comparison between the renewable & fossil fuel energy including the Environmental Impact Analysis.

4 + 8 = 12