M.TECH/REEN/2ND SEM/REEN 5203/2017

RENEWABLE ENERGY II

(REEN 5203)

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) Vertical axis wind turbine does not require
(a) massive tower (b) yaw mechanism
(c) high start up speed (d) all of these.

(ii) *"Ring of fire"* surrounds
(a) Pacific Ocean (b) Atlantic Ocean
(c) Indian Ocean (d) Arabic Sea.

(iii) The outermost layer of the earth is
(a) Magma (b) Mantle
(c) Crust (d) Solid iron core.

(iv) Which energy is not related to Sun?
(a) Wind (b) Tidal
(c) Geothermal (d) all of these.

(v) In tidal power, mostly used turbine is
(a) Bulb turbine (b) Pelton turbine
(c) Francis turbine (d) all of these.

(vi) Wave power is created by
(a) tides (b) winds
(c) sea currents (d) all of these.

(vii) Efficiency of OTEC cycle is nearly
(a) 2-3% (b) 5-7%
(c) 7-12 % (d) more than 12%.

(viii) A fuel cell, in order to produce electricity, burns:
(a) Helium (b) Nitrogen
(c) Hydrogen (d) none of the these.

(ix) Francis turbine is
(a) reaction turbine (b) radial flow turbine
(c) applicable for medium head (d) none of the these.

(x) Kaplan turbine is
(a) tangential flow turbine (b) mixed flow turine
(c) applicable for low discharge turbine (d) low head turbine.

Group - B

2.(a) What are the origins of wind? Discuss factors affecting wind distribution.

(b) Determine the total power produced from a wind turbine of diameter 40 m, operates at 12 m/s with air at standard atmospheric pressure and 20 ^{o}C. Conversion efficiency is 45 %.

(3 + 3) + 6 = 12

3.(a) Discuss about different geothermal power plants with layout.

(b) Explain the environmental impact of geothermal energy.

8 + 4 = 12

Group - C

4.(a) What are the advantages and disadvantages of tidal power?

(b) Discuss the working principle of a single basin double effect tidal power cycle.

6 + 6 = 12

5.(a) Derive the expression of wave power estimation.

(b) Briefly explain the working principles of any two types of wave power conversion technology.

6 + 6 = 12

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Group - D

6.(a) Explain the working of different types of OTEC cycles with layout.

(b) Derive the expression of maximum hydraulic efficiency of a Pelton wheel.

6 + 6 = 12

7.(a) Draw a schematic diagram of hydro electric power plant and briefly explain the functions of different component.

(b) A Pelton wheel having tangential velocity 12 m/s operates under a net head of 220 m. Bucket deflects at 165^{o} and discharges 150 liter per second. Determine power available at nozzle inlet and hydraulic efficiency of the turbine if coefficient of velocity is 0.96. Draw velocity triangles.

6 + (4 + 2) = 12

Group - E

8.(a) Explain the basic principle of MHD generator.

(b) Discuss about the thermionic power conversion system with diagram.

6 + 6 = 12

9.(a) Briefly classify the different types of fuel cells.

(b) Discuss about the storage, delivery and safety issues of hydrogen.

6 + 6 = 12