

M.TECH/RE/1ST SEM/ REEN 5101/2019
RENEWABLE ENERGY RESOURCE AND CHARACTERISTICS
(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) In order to produce electricity which of the following a fuel cell burns?
(a) Helium (b) Nitrogen (c) Hydrogen (d) None of the mentioned.
- (ii) Which of the following is a disadvantage of most of the renewable energy sources?
(a) Highly polluting
(b) High waste disposal cost
(c) Unreliable supply
(d) High running cost.
- (iii) Both power and manure are provided by
(a) Nuclear plants (b) Thermal plants
(c) Biogas plants (d) Hydroelectric plant.
- (iv) The outermost layer of the earth is
(a) Magma (b) Mantle (c) Crust (d) Solid iron core.
- (v) The one thing that is common to all fossil fuels is that they
(a) were originally formed in marine environment
(b) contain carbon
(c) have undergone the same set of geological processes during their formation
(d) represent the remains of one living organisms.

- (vi) Photovoltaic energy is the conversion of sunlight into
(a) Chemical energy (b) Biogas (c) Electricity (d) Geothermal energy.
- (vii) Horizontal axis and vertical axis are the types of
(a) Nuclear reactor (b) Wind mills
(c) Biogas reactor (d) Solar cell.
- (viii) Which among the following is not a renewable source of energy?
(a) Solar energy (b) Biomass energy
(c) Hydro-power (d) Geothermal energy.
- (ix) Which of the following type of collector is used for low temperature systems?
(a) Flat plate collector
(b) Line focussing parabolic collector
(c) Paraboloid dish collector
(d) All of the above.
- (x) The zenith angle is the angle made by the sun's rays with the ___ to a ____ surface.
(a) normal, horizontal (b) tangent, horizontal
(c) normal, vertical (d) tangent, vertical

Group – B

2. (a) What is renewable energy? Why it is called 'renewable'? What is its importance in human civilization? Describe the different sources of renewable energy.
(b) Compare renewable and non-renewable energy.
3. What is fuel cell? Write the name of different types of fuel cells. Describe the working principle of PEMFC.

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

$$2 + 3 + 7 = 12$$

Group – C

4. (a) What are the different types of solar collectors? What are their specific uses? What are the major component of radiation in calculating total radiation on a tilted surface. Provide expression for calculating the individual components.
(b) Compute the tilt factor for beam radiation received on a flat plate collector facing south with a slope of 12 degree. The collector is located at a place 20 degree North. Calculations are needed for 15th October. The hour angle is 7.5 degree.
5. (a) Define local apparent time (LAT), azimuth angle.
(b) Describe the working principle of PV solar cells.

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

$$(3 + 3) + 6 = 12$$

Group – D

6. (a) What is wind turbine? Write the equation of a power developed in wind turbine. Name the schemes for maximum power extraction.
(b) Describe the different techniques used for wind resource assessment. Write the different energy loss factor in wind tower. Does with turbine's height influence power generation?
7. (a) Describe the different configurations of wind turbines. Write the difference between horizontal axis and vertical axis wind turbines.
(b) What are the factors to be considered in selecting the site of a hydroelectric power plant? Describe the classification of hydroelectric power station according to its head.

$$(2+2+3) + (2+2+1) = 12$$

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

Group – E

8. (a) Describe the origin of biomass. What is importance of the chemical composition of biomass?
(b) Write the difference between aerobic and anaerobic bioconversion process with biochemical reactions. What is the importance of TGA and DSC analysis of a biomass sample?
9. (a) Describe the working principle of OTEC with schematic diagram. What is its difference from ocean wave energy conversion?
(b) Write a short note on power generation using geothermal heat.

$$(4 + 2) + (3 + 3) = 12$$

$$(6 + 3) + 3 = 12$$