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SARDAR PATEL UNIVERSITY

M.Sc. Renewable Energy Examination (Semester -I)

Tuesday, 25-10-2016, Time: 10.00 to 01.00P.M

PS01CREN02: Solar Energy

Total Marks: 70

Q-1 Select the most appropriate options

(8x1= 08)

1. The Source of energy of the sun is \_\_\_\_\_
  - a) Nuclear fission
  - b) Chemical reaction
  - c) Nuclear fusion
  - d) Photo thermal reaction
2. The average solar power incident on the Earth's surface is about
  - a) 1000 mW cm<sup>-2</sup>
  - b) 1 kW m<sup>-2</sup>
  - c) 100 W cm<sup>-2</sup>
  - d) 1000 W cm<sup>-2</sup>
3. Pyroheliometer is an instrument that measures the following type of solar radiation
  - a) Diffuse solar radiation
  - b) Scattered solar radiation
  - c) Beam solar radiation
  - d) Total radiation
4. We have seasons because:
  - a) In the winter earth is farther from the Sun than in the summer.
  - b) In the Winter the Sun is lower in the sky so the angle in between
  - c) the incoming radiation and ground is small
  - d) The days are short so there is less solar radiation to heat the ground
  - e) B and C are correct
5. The amount of solar radiation received on a unit area exposed perpendicularly to the rays of the sun at an average distance between the sun and the earth is defined as
  - a) Solar insolation
  - b) Solar constant
  - c) Solar radiation
  - d) Solar insulation
6. In solar water heating system, the common material used in water carrying pipe in a solar collector is
  - a) Iron
  - b) Steel
  - c) Copper
  - d) Bronze
7. Solar cell convert light energy into
  - a) Potential energy
  - b) Electrical energy
  - c) Kinetic energy
  - d) None of the above
8. A dish-type solar cooker has which of the following types of reflecting dish?
  - a) Rectangle
  - b) Parabolic
  - c) Circular
  - d) Square

Q-2 Answer any seven questions

(7x2=14)

1. What is solar constant?
2. Explain Sunrise, sunset and day length
3. Define beam, diffuse and global solar radiation.
4. Determine L.S.T and declination at Bhopal  $23^{\circ} 15'$ ,  $77^{\circ} 30'$  at 12.30 IST on June 19. ( $E = 1' 01''$ )
5. Calculate the day length at location  $28^{\circ} 35'N$ ,  $77^{\circ} 12'E$  on December 1.
6. Classify different type of solar energy measuring equipment's
7. Define active and passive system
8. Write the principle of solar cell.
9. Differentiate different type of tracking and non-tracking collectors and its temperatures.

Q-3 A) Discuss the structure of the sun in detail. Discuss the sun-earth relationship. (06)

Q-3 B) What is the declination on January 30, March 22, August 10? (06)

(OR)

Q-3 B) Describe electromagnetic spectrum, its wavelength and approximate percentage of available total energy on the earth. (06)

Q-4 A) Describe the working principle of different solar radiant energy measuring equipment's with diagram. Discuss the merits and demerits of each technology. (06)

Q-4 B) Calculate sunset hour angle and day-length at location latitude of  $35^{\circ}N$ , on February 14. (06)

(OR)

Q-4 B) Discuss the working principle of Eppley pyranometer & sunshine recorder. (06)

Q-5 B) Write in detail estimation of average solar radiation (06)

Q-5 B) Determine the value of  $H_{av}$  over a horizontal surface for June 22, at the latitude of  $10^{\circ}N$ , if  $a = 0.3$ ,  $b = 0.51$  and  $n/N = 0.55$  (06)

(OR)

Q-5 B) Write in detail estimation of direct and diffuse solar radiation

Q-6 A) Classify solar thermal energy collecting devices and explain each solar thermal collector technology with diagram. Write the advantages of each collector technology (06)

Q-6 B) What is solar pond? What are the arrangements made in solar pond to retain heat energy content in solar pond? Discuss advantage and disadvantage of this technology. (06)

(OR)

Q-6 B) Discuss working principle of solar desalination plant with neat sketch diagram & its advantages and disadvantages. (06)

(2)