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SARDAR PATEL UNIVERSITY

M.Sc. Renewable Energy Examination (Semester –III)

Saturday, 29-10-2016, Time: 02.00 to 05.00P.M

PS03ESYT03: MODELLING OF SOLAR THERMAL SYSTEM

Total Marks: 70

(8x1=8)

Q-1 Select most appropriate answer

1) The rate at which energy is lost from the storage tank to the surroundings at T_a' is
   a) $(UA)_s (T_s-T_a')$
   b) (T_s-T_a)
   c) (T_a-T_s)
   d) None of the above

2) Solar saving fraction is the fraction of the net reference load that is met by solar energy
   a) $f_{ns} = 1 - L_A/L_{ns}$,
   b) $L_{ns} = 24 (UA)ns (DD)$
   c) $L=24(UA)(DD)$
   d) all the above

3) What kind of solar radiation is concentrated in CPC collectors?
   a) Diffuse radiation only
   b) Beam radiation only
   c) Both diffuse and beam radiation
   d) None of the above

4) What is the typical range of concentration ratio for CPC collectors?
   a) 1-10
   b) 10-50
   c) 100-200
   d) None of the above

5) Direct solar energy used for
   a) Water heating
   b) Distillation
   c) Drying
   d) All the above

6) Which of the following radiation decolouring food items in open sun drying
   a) UV radiation
   b) Solar radiation
   c) Electromagnet radiation
   d) Visible radiation

7) The f-chart method provide for estimating the _____ supplied by solar energy
   a) Total heating load
   b) Total cooling load
   c) Both heating and cooling load
   d) None of the above

8) Passive solar design
   a) Is useful in all climates
   b) Depends on proper house orientation
   c) Can save your money
   d) All the above

Q-2 Answer <u>any seven</u> questions **(7x2=14)**

1. Write the disadvantages of open sun drying
2. Define load collector ratio and total load coefficient.
3. What is solar aperture?
4. What is concentration ratio
5. What is difference between an active and passive solar system
6. Write the need for f-chart method
7. What is utilizability factor in solar collector system?
8. Draw the schematic diagram of different type of non-porous absorber air heater
9. Define daily utilizability factor of a solar collector system

Q-3 A) Describe collector heat exchanger factor with neat schematic diagram. **(06)**

Q-3 B) Describe duct and pipe loss of solar collector system. **(06)**

OR

Q-3 B) Describe performance of serially connected and partially shaded solar collectors **(06)**

Q-4 A) Classify the different type of air heater with neat sketch diagram and give the thermal analysis of conventional air heater. **(06)**

Q-4 B) Write experimental setup, methodology and thermal analysis for open sun drying. **(06)**

OR

Q-4 B) Air at 28°C approaches a 0.8m long and 0.5m wide flat plate (at 40°C) with an approach velocity 4m/s. Determine the total rate of heat transfer from the plate to the air. The viscosity of air is 1.578×10^{-5}. The flow being laminar, the heat transfer coefficient is given by the equation $h = \left(\frac{K}{L}\right)(0.664) Re^{1/2} Pr^{1/3}$. The value of P_r =0.713, k=0.026, $Re = 2.027 \times 10^5$ **(06)**

Q-5 A) Describe f-chart method and explain briefly for liquid and air collector system with suitable graphical diagram. **(06)**

Q-5 B) Describe φ,f-chart method for closed loop solar system with graphical diagram. **(06)**

OR

Q-5 B) Describe the hourly utilizability of solar flat plate collector system **(06)**

Q-6 A) Explain monthly energy stream for direct-gain building with neat sketch diagram. **(06)**

Q-6 B) Explain monthly energy flows for a collector-storage wall building with neat sketch diagram. **(06)**

OR

Q-6 B) Give brief explanation for active and passive solar system with neat sketch diagram. **(06)**

— X — (2) — X —