MASTEROFTECHNOLOGY IN ENERGY SCIENCE&

TECHNOLOGY EXAMINATION, 2019

(2nd Semester)

SOLAR THERMAL ENERGY SYSTEMS

Time: Three hours Full Marks: 100

Answer***any five*** from the followingquestions.

1. (a) What do you understand by Solar Thermal power? Explain its different route.

(b) State and explain the following terms;

(i) Air mass

(ii) Solar azimuth angle

(iii) Solar constant

(iv) Declination angle

(v) Zenith angle

(c) What are the instruments used for measuring solar radiation?

[8 + 10 + 2]

2. (a) What are the merits and demerits of a Flat-Plate collector over a Concentrating collector?

(b) For a liquid based flat-plate collector, with standard notation show that,

$$F' = \frac{\frac{1}{U_L}}{W\left\{\frac{1}{U_L[D+(W-D)F]} + \frac{1}{C_b} + \frac{1}{\pi D_i h_{fi}}\right\}}$$

[5 + 15]

3. (a) With a neat sketch describe the experimental set up for the performance evaluation of a solar water heating system.

(b) Describe the test Procedure in details and express the derive terms mathematically.

[10 + 10]

4. (a) What do you understand by concentrating collectors?

(b) Explain area concentration ratio and flux concentration ratio. And deduce the expression of Maximum concentration ratio for circular and linear concentrator.

(c) With standard notations for a parabolic trough collectors with a cylindrical tube receivers, show that the collector efficiency factor can be given by ,

$$F' = \frac{1/U_L}{\frac{1}{U_L} + \frac{D_o}{h_{fi}D_i} + \left(\frac{D_o}{2k}\ln\frac{D_o}{D_i}\right)}$$

[2 + 6 + 12]

5. (a) What do you understand by non-imaging concentrator? Explain its advantage and disadvantage over an imaging concentrator.

(b) With neat sketch explain the operating principle of a non-imaging concentrator.

(c) State and explain the followings;

(i) Cumulative solar savings(CSS) and Life cycle savings(LCS)

(ii) Net present value(NPV)

(iii) Payback period

[4 + 8 + 8]

6. (a) What do you understand by thermal stratification?

(b) Explain the methods of analysis of a stratified energy storage tank for solar water heating system.

(c) What is f-Chart Method? Explain.

[3 + 12 + 5]