



Reg. No. : .....

Name : .....

**Second Semester M.Tech. Degree Examination, September 2015**  
**(2013 Scheme)**  
**Mechanical Engineering**  
**MTE 2007 : SOLAR THERMAL ENGINEERING (Elective)**

Time : 3 Hours

Max. Marks : 60

**Instruction :** Answer **any two full** questions from **each** Module, **each** question carries **10** marks.

**MODULE – I**

1. Explain the following terms as related to the solar radiations :
  - i) Apparent motion of sun
  - ii) Tilt factor for diffused radiations
  - iii) Sunshine recorder
  - iv) Solar constant.
2. Find the Solar altitude and azimuth angle at solar noon on February 1 at place of latitude =  $29.68^{\circ}\text{N}$  and longitude =  $82.27^{\circ}\text{W}$ . Also find the sunrise and sunset time on that day. Standard time longitude =  $75^{\circ}$  for that place.
3. Describe the working principle of the pyrheliometer with neat diagram. How it is different from the pyranometer ?



**MODULE – II**

4. Explain the following :
  - i) Cosine losses of heliostat field.
  - ii) Technical challenges and advantages of parabolic dish collector.
  - iii) Methods of controlling scheme for direct steam generation in parabolic trough collector.
  - iv) Effect of the fluid temperature on the parabolic trough collector performance.



5. Explain the tracking requirements for a Compound Parabolic Collector (CPC).  
Derive swing angle for CPC tracking.
6. Discuss the basic principle of salt-pond used for thermal storage. What are the major problems to be faced and method used to solve them ? Discuss the advantages and disadvantages with water storage system.

### MODULE – III

7. Draw a diagram of swimming pool heating system using solar energy and explain its working. Which are the most important parameters considered for design ?
8. Explain the working of distributed collector solar thermal electric power plant with the help of a neat sketch.
9. The expected maintenance cost of solar heating system is Rs. 5000 in first year and increasing yearly with an inflation rate of 10%. If an alternative investment rate with 12% is available, then find out
  - i) Present worth factor
  - ii) The present value of the maintenance cost, if the system life is 10 year.