M.E. First Semester (Mechanical Engineering (Thermal Engineering)) (New-CGS)

13511 : Elective-I : Modern Energy Sources : 1 MTE 5

P. Pages : 2

Time : Three Hours

AW - 3534

Max. Marks : 80

Notes : 1. All question carry equal marks.
2. Answer **three** question from Section A and **three** question from Section B.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Diagrams and chemical equations should be given wherever necessary.

SECTION – A

1. Show that the heat removal factor **13**

$$F_R = \frac{F_P M C_P}{U_L A_C F_P}\left[1 - \exp\left(\frac{-A_C F_P U_L}{M \times C_P}\right)\right]$$

2. Explain the working of **any three.** **13**

i) Passive method of space heating.

ii) Solar pumping for irrigation purpose.

iii) Solar absorption refrigeration system.

iv) Low temperature Rankine cycle for power generation.

3. a) In case of solar photovoltaic systems, what do you mean by 'balance of system'? Briefly explain the concept of Maximum Power Point Tracker (MPPT). **6**

b) Explain the basic concept of solar Thermal power plant. Explain construction of the following type of solar collectors used for heat generation in such power plants :- **7**
i) Parabolic Through collector.
ii) Central receiver system with distributed reflector.

4. a) Sketch and explain indirect vapour cycle OTEC power plant. **6**

b) Show that average power generated in simple single power plant is $P_{av} = 0.225\,AR^2$ where, R-Range, A-Area of Basin. **7**

5. a) The mean area of tidal power plant is 70 km^2. The annual average tidal range is 10m and the opening effectiveness of the plant is 0.12. Determine the annual output of the plant. **7**

b) What are the technical difficulties in operation of OTEC plant? Take a review of advantages and disadvantages of OTEC. **7**

SECTION – B

6. a) Starting from the fundamentals show that the highest value of efficiency for wind mill is 59.3% which occurs at $V_2 = V_1 / 3$. **7**

b) What are the principle motions significant for the operation of wind mill. **7**

7. a) Explain Double basin tidal power plant with neat sketch. **6**

b) Draw and explain the graph between power coefficient and tip speed ratio. **7**

8. a) Take a review of geothermal fields in India along with it's potential. What are the problems associated with geothermal power plants? **6**

b) Explain the working of closed cycle MHD steam power plant. **7**

9. a) Compare PWR and BWR on following basis :- **6**

i) Fuel used. ii) Moderator.
iii) Coolant. iv) Steam cycle efficiency.

b) Explain with suitable sketch, the vapour dominated geothermal power plant. **7**

10. a) What is the basic concept of fast breeder reactor? With suitable sketch explain sodium cooled fast reactor. **6**

b) What is nuclear fusion? How does it differ from nuclear fission? **7**

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