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

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

P. Pages : 2 | AW - 3805

Time : Three Hours | Max. Marks : 80

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Notes :
1. All question carry equal marks.
2. Answer **any three** question from Section A and **any 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.
6. Illustrate your answer necessary with the help of neat sketches.

SECTION – A

1. a) Derive an Expression for temperature distribution across the absorber plate. **6**

b) A LFPC with tubes inline with absorber plate has an overall heat transfer coefficient of 5.8 W/m^2k. the inner and outer diameter of tubes are 14 mm to 18 mm respectively and tube centre to centre distance is 12 cm. the fluid to tube heat transfer coefficient is 205 W/m^2k. Calculate collector efficiency factor for absorber plate, material(GI) of 1.3 mm thick. **7**

2. a) What do you mean by photovoltaics. Sketch a typical rooftop solar system & list the role of each components. **7**

b) Sketch and Explain different types of concentrating collectors. Discuss their application. List various advantages of concentrating collectors over flat plate collector. **7**

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

i) Forced circulation water heating system with auxiliary heating source.

ii) Low temperature Rankine cycle for power generation.

iii) Solar vapour absorption refrigeration system.

iv) Box type solar cooker.

4. a) "Tidal power is basically hydropower", Explain With suitable sketch explain single basin tidal power plant. **7**

b) The mean area of tidal power plant is 70 km^2. The annual tidal range is 10 m & the opening effectiveness of the plant is 0.12. Determine the annual output of the plant. **6**

5. a) Differentiate between ocean thermal energy gradient and salinity gradient with neat sketch. **7**

b) Describe the closed cycle OTEC system with it's advantages over open cycle OTEC system. **6**

SECTION – B

6.	a)	Give the advantages of vertical axis wind mill over horizontal axis wind mill.	6
	b)	A WTG has a rotor diameter of 60 m and operates in a 40 kmph wind. The conversion efficiency is 0.75 and combined mechanical & electrical efficiency is 90%. The air density is 1.185 kg/m^3 Determine: i) The power output of WTG. ii) Power coefficient & performance coefficients. iii) Energy output in kWh/year for an annual plant factor of 0.45.	7
7.	a)	Draw and explain the graph between power coefficient & tip speed ratio.	6
	b)	Derive an expression for work output and efficiency of wind mill. Show that maximum theoretical efficiency of wind mill is 59.3% when $\frac{V_2}{V_1} = \frac{1}{3}$.	7
8.	a)	What is geothermal energy? Explain vapour dominated geothermal power plant?	7
	b)	Explain the working of closed cycle MHD steam power plant?	7
9.	a)	Draw a neat diagram of nuclear reactor and explain the function of different components.	7
	b)	What are Nuclear fuels? Which are most common nuclear fuels? Explain nuclear fission & the chain reaction.	6
10.	a)	What are fast breeder reactors? Explain with suitable sketch, any one type of it?	6
	b)	Explain the working of Pressurized Water Reactor (PWR) with neat sketch. What are it's advantages & disadvantages.	7

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