B.E. Mechanical Engineering Sixth Semester

ME604 - Thermal Engineering

P. Pages : 2 **GUG/W/18/1715**

Time : Three Hours * 1 3 4 9 * Max. Marks : 80

Notes :
1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Diagrams and Chemical equation should be given wherever necessary.
5. Retain the construction lines.
6. Illustrate your answers wherever necessary with help of neat sketches.
7. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.

1. a) Explain Velox boiler with neat sketch. **8**

b) Explain bubbling type fluidised bed combustions. **8**

OR

2. a) A boiler generates 8 kg of steam per kg of fuel burnt a pressure of 12 bar from feed water entering at 80ºC. The boiler is 75% efficient and its factor of evaporator is 1.15. Calculate **8**
a) Degree of superheat and temperature of steam generated.
b) Calorific value of fuel in kJ/kg.
c) Equivalent evaporation in kg of steam/kg of fuel.
Take specific heat of superheated steam a 2.3kJ/kgK.

b) What are boiler accessories? Explain any two in detail. **8**

3. a) Calculate the throat and exit diameters of a convergent divergent nozzle, which will discharge 820kg of steam/hr at a pressure of 8 bar superheated to 220ºC into a chamber having a pressure of 1.5 bar. The friction loss in the divergent portion of the nozzle may be taken as 0.15 of the isentropic enthalpy drop. **8**

b) With the help of h-s diagram explain the effect of irreversibilities on nozzle efficiency. **8**

OR

4. a) Compare actual indicator diagram with hypothetical indicator diagram of a steam engine. **8**

b) Explain working principle of steam turbine. Also classify them. **8**

5. A parson reaction turbine running at 400 rpm with 50% reaction develops 75kW/kg of the steam. The exit angle of the blade is 20º and the steam velocity is 1.4 times the blade velocity. Determine **16**
a) Blade velocity. b) Blade inlet angle.

OR

6.	a)	Explain nozzle control governing of steam turbine in detail.	**8**
	b)	Elaborate various losses in steam turbine.	**8**
7.	a)	What are elements of a condensing plant? Explain low-level counter flow jet condenser.	**8**
	b)	Explain a) Dalton's law of partial pressure. b) Vacuum efficiency.	**8**

OR

8.	a)	What are cooling towers? Explain mechanical draft cooling tower.	**8**
	b)	Explain the working of a shell and tube type of surface condenser.	**8**
9.		Calculate the power required to compress $25m^3$/min atmospheric air at 101.3kPa, 20ºC to a pressure ratio of 7 in an LP cylinder Air is then cooled at constant pressure to 25ºC in an intercooler, before entering HP cylinder, where air is again compressed to a pressure ratio of 6. Assume polytropic compression with n = 1.3 and R = 0.287 kJ/kgK.	**16**

OR

10.	a)	Explain working of single acting air compressor with clearance.	**8**
	b)	Obtain an expression for indicated work for a single acting compressor without clearance.	**8**

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