B.E.(with Credits)-Regular-Semester 2012 - Mechanical Engineering Sem VI ME604 - Thermal Engineering

## P. Pages: 2

Time : Three Hours

Notes: 1.

All questions carry as indicated marks.

## GUG/W/16/5398

Max. Marks :80

		<ol> <li>Due credit will be given to neatness and adequate dimensions.</li> <li>Assume suitable data wherever necessary.</li> <li>Diagrams and Chemical equation should be given wherever necessary.</li> <li>Retain the construction lines.</li> <li>Illustrate your answers wherever necessary with the help of neat sketches.</li> <li>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.</li> <li>Solve Qu. 1 or Qu.2; Qu.3 or Qu.4, Qu.5 or Qu.6, Qu.7 or Qu.8, Qu.9 or Qu.10.</li> </ol>	
1.	a)	Explain in detail the principle of fluidized bed combustion with neat sketch.	6
	b)	The following observations were made on a boiler plant during 1hr test. Steam pressure =20bar; Steam temperature =260°C; steam generated = 37500kg, Temp. of water entering the economizer =15°C, temp. of water leaving the economizer =90°C; fuel used = 4400kg, calorific value of fuel used =30,000 KJ/Kg, calculate; i) Equivalent evaporation per kg of fuel. ii) Thermal efficiency. iii) Percentage of heat energy of fuel energy utilized by the economizer. <b>OR</b>	10
2.	a)	What are boiler mounting? Explain any one mounting in detail with neat sketch.	8
	b)	A 40m high chimney is discharging flue gases at 623k, when the ambient temp. is 303K. The quantity of air supplied is 13kg of air per kg of fuel burnt. Determine:	8
		<ul> <li>i) Draught produced in mm of water column.</li> <li>ii) Equivalent draught produced in meter of hot gas column.</li> <li>iii) Chimney efficiency, if the minimum temperature of artificial draught is 423k. The mean specific heat of flue gases is 1.005 KJ/kg.</li> </ul>	
3.	a)	What is steady flow energy equation as applied to steam nozzle? Explain its use in the calculation of steam velocity at the exit of a nozzle.	6
	b)	A steam nozzle supplied a steam at 15 bar and 350°C and discharges at 1bar. The divergent portion of nozzle is 80mm long and throat diameter is 6mm. Determine the cone angle of divergent portion. Assume that 12% of total enthalpy drop is lost in the friction in divergent portion. Also determine the velocity and condition of steam at throat.	10

## OR

4.	a)	Classify the steam turbines, Explain the construction & working principle of impulse steam turbine with neat sketch.	8
	b)	Why compounding of steam turbine is required? What are the methods of compounding? Explain any one method of compounding.	8
5.	a)	What is blading efficiency; stage efficiency; nozzle efficiency and axial thrust.	6
	b)	A parsons reaction turbine, while running at 400 rpm consumes 30 tomes of steam per hour. The steam at a certain stage is at 1.6 bar with dryness fraction 0.9 & stage develops 10 kW. The axial velocity of flow is constant & equal to 0.75 of the blade velocity. Find the mean diameter of drum & volume of steam flowing per seconds. Take blade tip angles at inlet and outlet as 35° & 20° respectively. <b>OR</b>	10
6.	a)	Enumerate and explain various energy losses in a steam turbine.	8
	b)	Explain Governing of steam turbine in detail. Enlist the methods of governing and explain any one in details.	8
7.	a)	How condensers are classified? Explain parallel flow jet condenser in detail.	8
	b)	A surface condenser is designed to handle 10000kg of steam per hour. The steam enters at 0.08bar and 0.9 dryness. The condensate leaves the corresponding saturation temperature. The pressure is constant throughout the condenser. Estimate the cooling water flow rate per hour, if the cooling water temp. rise is limited to 10°C <b>OR</b>	8
8.	a)	Explain the various sources and effects of air leakages in a steam condenser.	8
	b)	<ul> <li>Write short notes on:</li> <li>i) Cooling tower.</li> <li>ii) Weight of cooling water required for condensation of steam.</li> </ul>	8
9.	a)	Why clearance is necessary in reciprocating air compressors? Derive the expression for work done in case of single acting single stage air compressor with clearance.	8
	b)	A single stage single acting reciprocating air compressor has a cylinder dia. & stroke of 200mm & 300mm resp. The compressor sucks air at 1 bar & 27°C and delivers at 8 bar while running at 100rpm. Find. i) Indicated power of compressor. ii) Mass of air delivered by compressor per minute & iii) Temp of air delivered by compressor. The compression follows the law $PV^{1.25} = C$ ; Take R = 287 J/kgK <b>OR</b>	8
10.	a)	With neat sketch explain two stage compression with intercooling. What are the advantages of multi staging.	8
	b)	Elaborate the methods employed to isothermal compression in High speed compressors.	8

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