PCCME202 - Applied Thermodynamics

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Notes : 1. All questions carry marks as indicated.
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. Illustrate your answers wherever necessary with the help of neat sketches.
6. 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.
7. Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10,

1. a) Explain Otto cycle in detail. Derive the expression for air standard efficiency of Otto cycle.   **8**

b) A Diesel Engine has a compression ratio of 15 and heat addition at constant pressure takes place at 6% of stroke. Find the air standard efficiency of Engine.   **8**

OR

2. a) Write short note on: **8**

     i) Rankine Cycle

     ii) Stirling Cycle

b) Calculate the percentage loss in ideal efficiency of diesel engine with compression ratio of 14 if fuel cut off is delayed from 5% to 8%.   **8**

3. a) Elaborate boiler efficiency and equivalent evaporation in boiler in detail.   **8**

b) Explain Velox boiler with neat sketch.   **8**

OR

4. a) Discuss classification of boiler in detail.   **8**

b) What is role of following in boiler (i) Safety valve (ii) Fusible plug (iii) Pressure gauge (iv) Water level indicator   **8**

5. a) Discuss various types of nozzles. Derive the expression for velocity of steam at nozzle exit.   **8**

b) A nozzle is to be designed to expand steam at the rate of 0.10 kg/s from 500 kPa, 210ºC to 100 kPa. Neglect inlet velocity of steam. For a nozzle efficiency of 0.9, determine exit area of nozzle.   **8**

OR

6.	a)	Explain working principle of impulse and reaction turbine with neat sketch.	**8**
	b)	What do you mean by governing of steam turbine? Explain throttle control governing in detail.	**8**

7. The rotor of an impulse turbine is of 260 mm diameter and runs at 20500 rpm. The nozzle angle is 20º and issues a steam jet with a velocity of 910 m/s. The mass flow rate through the turbine nozzles blading is 2 kg of steam per second. Draw the velocity diagram and calculate (a) tangential force in blades (b) axial force on blades (c) power developed by turbine (d) blading efficiency. **16**

OR

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

9.	a)	What are the elements of condensing plant? Discuss function of condenser.	**8**
	b)	Elaborate low level counter flow jet condenser with neat sketch.	**8**

OR

10. Write short notes on **any four**: **16**

a) Cooling tower

b) Cooling pond

c) Daltons law of partial pressures

d) Condenser efficiency and vacuum efficiency

e) Sources of air in condenser and its effects

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