



- Notes :
1. All questions carry 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 answer 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, Psychometric 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 Diesel cycle in detail. Derive the expression for air standard efficiency of Diesel cycle. 8
- b) The minimum pressure and temperature in an Otto cycle are 100 kPa and 27°C. The amount of heat added to the air per cycle is 1500 kJ/kg. Determine the pressure and temperatures at all points of Otto cycle. Also determine the specific work and thermal efficiency of the cycle for a compression ratio of 8:1. Take $C_p = 0.72$ kJ/kgK and $\gamma = 1.4$ for air. 8

OR

2. a) Write short note on 8
 - i) Dual Cycle
 - ii) Ericsson cycle.
- b) In an engine working on Dual cycle, the temperature and pressure at the beginning of the cycle are 90°C and 1 bar respectively. The compression ratio is 9. The maximum pressure is limited to 68 bar and total heat supplied per kg of air is 1750 kJ. Determine
 - i) Pressure and temperature at all salient points
 - ii) Air standard efficiency.8
3. a) With neat sketch explain Cochran boiler. 8
- b) With neat sketch explain the working of economizer and superheater in boiler. 8

OR

4. a) Draw and discuss lay out of thermal power plant. 8
- b) Compare fire tube and water tube boilers in detail. 8
5. a) What do you mean by critical pressure ratio? Derive its expression. 8
- b) Calculate the critical pressure and throat area per unit mass flow rate of steam expanding through a convergent – divergent nozzle from 10 bar, dry saturated down to atmospheric pressure of 1 bar. Assume that the inlet velocity is negligible and that the expansion is isentropic. 8

OR

6. a) What do you mean by governing of steam turbine? Explain throttle control governing in detail. **8**
- b) Write short note on **8**
- i) Impulse turbine
 - ii) Pressure compounding of steam turbine

7. In a parsons reaction turbine, the angles of receiving tips are 35° and discharging tips 20° . The blade speed is 100 m/s. Calculate the tangential force, power developed, diagram efficiency and axial thrust of turbine, if the steam consumption is 1 kg/min. **16**

OR

8. Discuss and derive expressions for **16**
- a) Blade efficiency
 - b) Stage efficiency
 - c) Axial thrust
 - d) Force and work done on blade.
9. Write short notes on **any two**. **16**
- a) Shell and tube type of surface condenser
 - b) Evaporative condenser
 - c) High level jet condenser

OR

10. a) With neat sketch discuss, natural draft cross flow cooling tower. **8**
- b) Derive the expression to determine cooling water requirement in condenser. **8**
