SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR 16

ROLL No: | | | | | | | | | | | | | | **Total number of pages:[2]**

B.Tech. || ME || 3rd Sem

Applied Thermodynamics-I

Subject Code: BTME-304A

Time allowed: 3 Hrs **Max Marks: 60**

Important Instructions:

- **All questions are compulsory**
- **Assume any missing data**
- **Use of Steam tables allowed.**

PART A (10x 2marks)

Q. 1. Short-Answer Questions:

(a) Draw the velocity diagram of impulse reaction turbine.
(b) Compare 2 stroke SI engine with 4-stroke SI engines.
(c) Determine enthalpy of steam if its pressure of 5 bar and dryness fraction of 0.85.
(d) State the function of steam accumulators.
(e) Draw schematic diagram of combined reheat regenerative cycle.
(f) Define nozzle efficiency.
(g) State the elements of condensing plant.
(h) Define reheat factor.
(i) Why there is need of compounding of impulse turbines?
(j) What do you mean by octane rating of fuels?

PART B (5×8marks)

Q. 2. Explain the combustion in CI engines and also discuss knocking, and its effects in CI engine? CO1

OR

(a) Discuss the combustion problems in Boilers. CO1

(b) What do you understand by supercharging of I.C. engines? Give its advantages and applications.

Q. 3. Steam at a pressure of 25 bar and 500°C is expanded in a steam turbine to a condenser pressure of 0.5 bar. Determine for Rankine cycle : (i) The thermal efficiency (ii) specific steam consumption. Also determine the improvement of efficiency which would result if a single stage of regenerative feed heating were added to a steam cycle having terminal conditions of 16 bar and 250°C. Neglect the pump work. CO2

OR

(a) Write short notes on, water level indicator, safety valves, fusible plug and blow off cock. CO2

(b) Sketch and completely label a Lancashire boiler. Also explain its working.

Q. 4. (a) Discuss the different losses in steam turbines. CO3

(b) Describe the governing in steam turbines. Give different methods for governing in steam turbines.

OR

Describe the working of reaction turbine with the help of neat sketch. Explain CO3

why pure reaction turbine is not used in practice. How does a reaction turbine blade differ from impulse turbine?

Q. 5. In a nozzle steam expands from 12 bar and 300°C to 6 bar with flow rate of 5 kg/s. Determine throat and exit area if exit velocity is 500 m/s and velocity at inlet to nozzle is negligible. Also find coefficient of velocity at exit. Coefficient of velocity is the ratio of actual velocity of fluid at nozzle exit to the velocity at exit considering isentropic flow through nozzle CO4

OR

(a) How does condenser improve performance of steam power plant? Discuss different types of condenser briefly. CO4

(b) What do you understand by cooling towers? Explain their utility.

Q. 6. In a single stage simple impulse turbine the steam flows at rate of 5 kg/s. It has rotor of 1.2m diameter running at 3000 rpm. Nozzle angle is 18°, blade speed ratio is 0.4, velocity coefficient is 0.9, and outlet angle of blade is 3° less than inlet angle. Determine blade angles and power developed. CO5

OR

A Parson's reaction turbine has mean diameter of blades as 1.6 m and rotor moving at 1500 rpm. The inlet and outlet angles are 80°and 20°respectively. Turbine receives steam at 12 bar, 200°C and has isentropic heat drop of 26 kJ/kg. 5% of steam supplied is lost through leakage. Determine the following considering horse power developed in stage to be 600 hp. CO5

(a) the work done

(b) the stage efficiency