

Saturation temperature °C	Specific enthalpy kJ/kg		Specific entropy kJ/kg K		Specific heat kJ/kg K	
	Liquid	Vapour	Liquid	Vapour	Liquid	Vapour
40	256.41	419.43	1.1905	1.7111	1.498	1.145
0	200.00	398.6	1.000	1.7271	1.341	0.897

- Q.3 (a)** What is the function of fins in heat transfer? State applications of fins. **03**
(b) Explain with schematic diagram open cycle gas turbine with regeneration. **04**
(c) The air enters the compressor of an open cycle constant pressure gas turbine at a pressure of 1 bar and temperature 25°C. The pressure of air after compression is 5 bar. The isentropic efficiencies of compressor and turbine are 85%. The air fuel ratio used as 90:1, the flow rate of air is 3 kg/s. Find: (i) power developed, and (ii) thermal efficiency of cycle. Assume: $C_p = 1.005$ kJ/kg and $\gamma = 1.4$ for air and gas, and Calorific value of fuel = 41,800 kJ/kg. **07**

OR

- Q.3 (a)** Define the terms: (i) Viscosity, (ii) Cohesion and adhesion, and (iii) Surface tension. **03**
(b) Plot the temperature distribution along the length of following heat exchangers: **04**
(i) parallel flow, (ii) counter flow, (iii) evaporator, and (iv) condenser.
(c) Flow rates of hot and cold water streams running through a parallel flow heat exchanger are 0.25 kg/s and 0.6 kg/s respectively. The inlet temperatures on the hot and cold sides are 80°C and 25°C respectively. The exit temperature of hot water is 45°C. If the individual heat transfer coefficients on both sides are 600 W/m² °C, calculate the area of the heat exchanger. **07**
- Q.4 (a)** State and prove Hydrostatic law. **03**
(b) What is notch? Derive an expression for discharge over a rectangular notch. **04**
(c) Derive an expression for steady state heat conduction through hollow cylinder. **07**

OR

- Q.4 (a)** Plot the main characteristics curves for centrifugal pump. **03**
(b) Explain fully the micro-manometers. **04**
(c) A pipe is having diameters 40 cm and 20 cm at the cross sections 1 and 2 respectively through which water is flowing. The velocity of water at section 1 is 5 m/s. Determine the velocity head at section 1 and 2, and also flow rate. **07**
- Q.5 (a)** Differentiate between impulse and reaction hydraulic turbines. **03**
(b) What is specific speed of centrifugal pump? Derive an expression of specific speed of centrifugal pump. **04**
(c) Francis turbine is designed to develop 150 kW, working under a head of 10 m and running at 200 rpm. The hydraulic losses in turbine are 15% of available energy. The overall efficiency of turbine is 80%. Assume: flow ratio = 0.94 and speed ratio = 0.25. Calculate: (i) the guide blade angle and runner vane angle at inlet, (ii) runner diameter and width at inlet. **07**

OR

- Q.5 (a)** Differentiate between Francis and Kaplan turbines. **03**
(b) Explain draft tube and its importance. **04**
(c) Explain performance characteristics curves of hydraulic turbines. **07**
