

22337

12223

3 Hours / 70 Marks

Seat No.

--	--	--	--	--	--	--	--

-
- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answer with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of Non-programmable Electronic Pocket Calculator is permissible.
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
(8) Use of Steam tables, logarithmic, Mollier's chart is permitted.

Marks

- 1. Attempt any FIVE of the following: 10**
- a) Define Gray body.
 - b) Represent Isochoric process on P-V and T-S chart.
 - c) State the function of :–
 - (i) Economiser
 - (ii) Fusible plug.
 - d) List four applications of nozzle.
 - e) What is the necessity of compounding of steam turbine?
 - f) State Dalton's Law of partial pressure.
 - g) State Fourier's Law of heat conduction.

P.T.O.

- 2. Attempt any THREE of the following:** **12**
- a) State extensive property and intensive property with two examples of each.
 - b) 2 kg of gas at 50°C is heated at constant volume until the pressure is doubled.
Determine:
 - (i) Final temperature.
 - (ii) Change in internal energy.
Take $C_V = 0.718$ kJ/kgK.
 - c) State the main features of Indian Boiler Regulation. (IBR)
 - d) Explain the working of Cochran boiler with neat sketch.
- 3. Attempt any THREE of the following:** **12**
- a) Define and state significance of Mach number.
 - b) Explain the working of impulse steam turbine with neat sketch. Also show pressure and velocity variation for the same.
 - c) A gas at 7 bar and 400 k occupies a volume of 0.2m³. The gas expands according to the law $PV^{1.5} = C$ upto pressure of 1.5 bar. Determine work transfer.
 - d) Wet steam at 10 bar pressure having total volume of 0.125 m³ and enthalpy content is 1800 kJ. Calculate mass and dryness fraction of steam.
- 4. Attempt any THREE of the following:** **12**
- a) Differentiate between natural draught and forced draught cooling tower.
 - b) A quantity of gas occupying 0.14 m³ at a pressure of 1400KPa and 300°C is expanded isentropically to 280 KPa. Calculate.
 - (i) Final temperature and
 - (ii) Work transfer.
 - c) A balloon is considered to be sphere of 10m diameter. The balloon is filled with hydrogen at 25°C and at atmospheric pressure. The temperature of the surrounding air is 20°C and at atmospheric pressure. Determine the load which can be lifted by the balloon.

- d) State :-
(i) Fourier's Law.
(ii) Thermal conductivity.
(iii) Newton's Law of cooling.
(iv) Radiation.
- e) Draw a neat sketch of surface condenser and label it.

5. Attempt any TWO of the following: 12

- a) Explain with neat sketch Regenerative feed heating. State its advantages.
- b) A refrigerator wall is constructed with two metallic plates 2mm. thick with 5cm. of glass wool insulation between them. Find the heat transfer per m^2 of area if inner and outer surface temperature are -10°C and 40°C . Assume thermal conductivity of metallic plates and glass wool are 50 W/mk and 0.1 W/mk respectively.
- c) Draw and explain temperature-Entropy diagram for formation of steam and show the following on it :-
(i) Saturated liquid line
(ii) Wet region
(iii) Critical point
(iv) Dryness fraction lines.

6. Attempt any TWO of the following: 12

- a) (i) Explain the application of second law of thermodynamics to heat engine.
(ii) Prove that, (C.O.P.) Heat pump = 1 + (C.O.P.) Refrigeration
- b) (i) State the sources of air leakage in condenser.
(ii) Vacuum gauge on condenser reads 700 mm. of 'Hg' when barometer reads 759 mm. of 'Hg'. Correct the vacuum to standard barometer of 760 mm. of 'Hg.'
- c) Suggest the type of heat exchangers for following applications:-
(i) Dairy plant. (Milk chilling plant)
(ii) Condenser of refrigeration system (Household system).
Justify your answers.
-