

22337

21819

3 Hours / 70 Marks

Seat No.

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- Instructions* –
- (1) All Questions are *Compulsory*.
 - (2) Illustrate your answers with neat sketches wherever necessary.
 - (3) Figures to the right indicate full marks.
 - (4) Assume suitable data, if necessary.
 - (5) Use of Steam tables, logarithmic, Mollier's chart is permitted.
 - (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

- 1. Attempt any FIVE of the following:** **10**
- a) Differentiate between Heat and Work.
 - b) State clausius statement of second law of thermodynamics.
 - c) Define dryness fraction and degree of superheat.
 - d) Define mach number and critical pressure.
 - e) Explain bleeding of steam.
 - f) State Dalton's law of partial pressure.
 - g) Define Fourier's law.

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- 2. Attempt any THREE of the following:** **12**
- a) State extensive property and Intensive property with two examples each.
 - b) Define isentropic process and plot it on P-V and T-S diagram.
 - c) Define:
 - (i) Sensible heat
 - (ii) Latent heat
 - d) Differentiate water tube boiler and fire tube boilers (any four)
- 3. Attempt any THREE of the following:** **12**
- a) State the term governing of turbine and explain nozzle control governing.
 - b) Explain principle of working of Impulse steam turbine with neat sketch.
 - c) A gas occupying 0.26 m^3 at 300°C and 0.4 MPa pressure expands till volume becomes 0.441 m^3 and pressure 0.26 MPa . Calculate the change in internal energy per kg of gas.
 $C_p = 1 \text{ kJ/kg K}$, $C_v = 0.71 \text{ kJ/kg K}$.
 - d) Determine the amount of heat supplied to 2 kg of water at 25°C to convert it into steam at 5 bar and 0.9 dry.
- 4. Attempt any THREE of the following:** **12**
- a) Differentiate between natural draught and forced draught cooling tower.
 - b) A gas has a volume of 0.14 m^3 , pressure 1.6 bar and a temperature 110°C . If the gas is compressed at constant pressure until its volume becomes 0.112 m^3 Determine:
 - (i) Work done in compression of gas
 - (ii) Heat given out by gas
 - c) A certain gas has $C_p = 1.968 \text{ kJ/kg K}$ $C_v = 1.507 \text{ kJ/kgK}$. Find the molecular weight and the gas constant. A constant volume chamber of 0.3 m^3 capacity contain 2 kg of this gas at 5°C . Heat is transferred to the gas until the temperature is 100°C . Find the work done and change in internal energy.

- d) Define:
- (i) Transmissivity
 - (ii) Black body
 - (iii) Grey body
 - (iv) Reflectivity
- e) Draw a neat sketch of surface condenser and label it.

5. Attempt any TWO of the following: 12

- a) List out any six losses in steam turbine.
- b) A steel pipe of inner and outer diameter 6 cm and 8 cm respectively has inside temperature 140°C and outside temperature 50°C. The thermal conductivity of steel is 24 W/mk. Calculate the rate of heat transfer through the pipe if length of pipe is 1.5 m.
- c) List any six methods of energy conservation in boilers.

6. Attempt any TWO of the following: 12

- a) Explain the necessity of compounding in steam turbine and draw a neat sketch of pressure velocity compounding.
 - b) (i) Explain the application of second law of thermodynamics to refrigerator.
(ii) State any three functions of steam condenser.
 - c) Derive characteristic gas equation using Boyle's and Charle's law.
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