22337

21819

3 Hours / 70 Marks Seat No. | | | | | | | | |

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.

Marks

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.
$C_P = 1$ kJ/kg K, $C_V = 0.71$ kJ/kg K.

d) Determine the amount of heat supplied to 2kg 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 0.112m^3 Determine:

(i) Work done in compression of gas

(ii) Heat given out by gas

c) A certain gas has $C_P = 1.968$ kJ/kg K $C_V = 1.507$ kJ/kgK. Find the molecular weight and the gas constant. A constant volume chamber of 0.3m^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.

Marks

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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