22337

24225

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 <u>FIVE</u> of the following: **10**

a) State Zeroth law of thermodynamics.

b) Define –

i) Dryness fraction

ii) Degree of superheat.

c) Differentiate between Heat and work. (Any two points)

d) List any four applications of steam nozzles.

e) Explain bleeding of steam.

f) State Dalton's law of partial pressure.

g) Define Fourier's law of thermal conduction.

Marks

2. Attempt any THREE of the following: **12**

a) Write steady flow energy equation and apply it to –

i) Boiler

ii) Nozzle.

b) Differentiate between Adiabatic process and Isothermal process.

c) Determine the amount of heat required to convert 2 kg of water at 25°C into steam at 5 bar and having 90% dry.

(Take Cp for water = 4.187 kJ/Kg°k)

From steam table –

At - 5 bar

i) hf = 640.1 kJ/kg

ii) hfg = 2107.4 kJ/kg.

d) Explain the regenerative feed heating with neat sketch.

3. Attempt any THREE of the following: **12**

a) Represent following process on

P-V and T-S diagram –

i) Isobaric Process

ii) Isochoric Process.

b) Two 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 Cv = 0.718 kJ/kg)

c) State the function of –

i) Fusibal plug

ii) Economiser

iii) Air preheater

iv) Blow off cock.

Marks

d) Classify steam turbine with respect.

i) Action of steam over moving blade.

ii) Expansion stages.

iii) Pressure of steam entering.

iv) Exhaust steam pressure.

4. Attempt any <u>THREE</u> of the following: **12**

a) State Extensive property and Intensive property with two examples of each.

b) A fluid expands from its initial condition of pressure 5 bar and volume 0.05 m^3 to final volume of 0.15m^3. It is carried out at constant temperature, then calculate –

i) Final pressure

ii) Work done.

c) Differentiate between fire tube boiler and water tube boiler. (Any four)

d) Explain with neat sketch construction of surface condensor.

e) Define –

i) Transmissivity

ii) Reflectivity

iii) Black body

iv) Grey body.

5. Attempt any <u>TWO</u> of the following: **12**

a) State Boyle's law and Charle's law and derive characteristic gas equation using above law.

b) State necessity of compounding of steam turbine. Explain with neat sketch pressure compounding.

Marks

c) In a surface condenser test the following observation were made –

Vacuum in condenser = 700 mm of Hg

Barometric pressure = 765 mm of Hg.

Mean temperature of condensation = 36.16°C.

Inlet temperature of cooling water = 17°C.

Outlet temperature of cooling water = 32°C.

Calculate –

i) Vacuum efficiency

ii) Condenser efficiency.

6. Attempt any <u>TWO</u> of the following: **12**

a) Explain with neat sketch construction and working of impulse turbine.

b) Explain with neat sketch construction and working of Loeffler boiler.

c) A wall of refrigerated van of 1.5 mm of steel sheet at outer surface, 10 mm plywood at the inner surface and 2 cm of glass wood in between. Calculate the rate of heat flow if the temperature at the inside and outside surface –15°C and 24°C.

Take –

K (for steel) = 23.2 w/m°k

K (for glass wood) = 0.14 w/m°k

K (Plywood) = 0.052 w/m°k.

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