22337

23242

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 answers with neat sketches wherever necessary.

(4) Assume suitable data, if necessary.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

(7) Use of Steam tables, logarithmic, Mollier's chart is permitted.

Marks

1. Attempt any FIVE of the following: **10**

a) State Boyle's Law.

b) State Stefan Boltzman Law.

c) Represent Isochoric process on P-V and T-S chart.

d) Differentiate between Heat and work.

e) Define Fourier Law.

f) Define vaccume efficiency of condenser.

g) State clausius statement of second law of thermodynamics.

Marks

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

a) Differentiate between heat engine and refrigerator. (any four points)

b) Enlist various losses in steam turbine.

c) A quantity of gas occupying 0.14 m^3 at pressure of 1400 kPa and 300° C is expanded isentropically to 280 kPa. Calculate

i) Final temp

ii) Work transfer

d) Find the condenser efficiency. When cooling water enters in condenser at temperature of 28°C and leaves at 39°C. The vaccume produced is 705 mm of Hg and barometer reads 760 mm of Hg.

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

a) 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.

b) Differentiate between natural draught and forced draught cooling tower.

c) Draw a neat sketch of surface condenser and label it.

d) A composite wall is formed of 2 cm copper plate, 3 mm asbestos layer and 4.5 cm. Fiber glass the wall (From surface to surface) is subjected to temperature difference of 500° C considering heat flow in one direction form surface to surface calculate heat flow per m^2 area of wall.

Take -

K Copper = 370 w/m° C

K asbestos = 150 w/m° C

K Fiber glass = 74 w/m° C

Marks

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

a) A certain gas has Cp = 1.968 KJ/kg Cv = 1.507 KJ/Kg K. Find molecular weight and gas constant. A constant volume chamber of 0.3 m^3 capacity contain 2 kg of this gas at 5º C. Heat is transferred to the gas until temperature is 100º C. Find work done and change in internal energy.

b) State the advantage of regenerative feed heating.

c) Classify condenser in detail.

d) Define.

i) Black body

ii) Gray body

iii) Absorptivity

iv) Reflectivity

e) State source of air leakage in condenser and its effects.

5. Attempt any TWO of the following: **12**

a) Draw PV and TS diagram of

i) Isobaric

ii) Isocloric

iii) Isothermal

iv) Adiabatic

b) A steel pipe of inner and outer Dia. 6 cm and 8 cm and inside temp. 140º C and outside temp 50º C Ksteel is 24w/mk calculate rate of heat transfer through pipe of 1.5 m length.

c) Draw sketch of Loeffler boiler. Describe working also.

Marks

6. Attempt any TWO of the following: **12**

a) A wall of refrigerator of 1.5 mm of steel at outer surface. 10 mm plywood at inner surface 2 cm of glass wool in between. Calculate the rate of heat flow if inside and outside temp are -5° C and 24° C. Take Ksteel = 23.2 w/m$^{\circ}$k K glass wool = 0.14 w/mk K plywood = 0.052 w/m$^{\circ}$k.

b) Explain the necessity of compounding in steam turbine and draw a neat sketch of pressure velocity compounding.

c) Explain with neat sketch shell and tube heat exchanger.