22337

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3 Hours / 70 Marks Seat No.

15 minutes extra for each hour

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) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

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

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

(8) 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) List the factors making the process irreversible.

b) List any two assumptions for ideal gas.

c) State the function of

i) Superheater

ii) Blow off cock

d) Recite the significance of Mach number.

e) Define critical pressure in nozzle.

f) State the functions of condenser.

g) Define thermal conductivity and State its unit.

P.T.O.

Marks

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

a) Write steady flow energy equation and apply it to turbine and condenser.

b) Differentiate between adiabatic and isothermal process.

(Four points)

c) Draw P-V and T-S diagram of Rankine cycle and list the processes involved in it.

d) Determine if the steam is wet or superheated and calculate the dryness fraction or the superheated steam temperature for P = 8 bar and V = 0.28 m^3/kg.

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

a) Describe with neat sketch nozzle control governing.

b) Classify turbines in details.

c) One Kg of air initially at 1 bar and 156°C is compressed isothermally till the volume is reduced to 0.28 m^3. Determine the work done and change in internal energy.

d) Recite the steps involved in energy conservation of boilers.

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

a) The partial absolute pressure in the condenser is 11.56 KPa when the barometer reads 1 bar. The condenser temperature is 40°C. Calculate partial pressure of air and vacuum efficiency.

b) 0.44 Kg of gas having a volume 0.28 m^3 and a pressure of 1.4 bar is compressed to a pressure of 14 bar according to $pv^{1.3} = C$. Find the change of internal energy.

C_p = 1.041 KJ/Kg-k

C_v = 0.743 KJ/Kg-k

c) A quantity of gas occupying 0.14 m^3 at a pressure of 1400 KPa and 300°C is expanded isentropically to 280 KPa calculate

i) Final temperature and

ii) Work transfer

Marks

d) Define natural and forced convection and give two examples of each.

e) Classify condensers in details.

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

a) Explain with neat sketch bleeding of steam. State its advantages.

b) Explain with neat sketch automotive heat exchanger.

c) Draw a schematic diagram of Mollier chart and list its features.

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

a) A refrigerator is loaded with fresh food and door is closed. After some period, machine consumes 1.25 KWh of electrical energy and internal energy of food items decreases by 4500 KJ. Calculate the magnitude and direction of heat transfer for the steam.

b) State the purpose of cooling tower and describe with neat sketch natural draught cooling tower.

c) Sheets of brass and steel each 10 mm thick are placed in contact. The outer surface of brass is kept at 100°C and outer surface of steel is kept at 0°C. Estimate the temperature of common interface if thermal conductivities of brass and steel are in the ratio of 2:1.