22337

12425

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 FIVE of the following: **10**

a) Define the following:

i) Intensive property

ii) Extensive property

b) Define:

i) Charle's Law

ii) Boyle's Law

c) Define:

i) Sensible heat

ii) Latent heat

Marks

d) List types of nozzles.

e) Define Mach number.

f) Define Dalton's Law of partial pressure.

g) State modes of heat transfer.

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

a) Explain with neat sketch Clausius statement.

b) Define Isobaric process. Also plot it on P-V, T-S diagram.

c) Describe generation of steam at constant pressure with temperature enthalpy diagram.

d) List types of Boiler Mountings and Accessories. (Any four types each)

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

a) List types of losses in steam turbine. (Any four)

b) Explain pressure compounding with neat sketch.

c) Represent P-V, T-S diagram of Adiabatic and Isochoric process.

d) Differentiate between water tube boiler and fire tube boiler.

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

a) Explain with neat sketch surface condenser.

b) A gas occupying $0.26m^3$ at 300°C and 0.4 MPa pressure expands till volume becomes 0.441 M^3 and pressure 0.26 MPa. Calculate change in internal energy per kg of gas.

C_p = 1 kJ/kgK, C_v = 0.71 kJ/kgK.

c) 5 kg of nitrogen is cooled in rigid tank from 250°C to 27°C. The initial pressure is 25 bar. Calculate the change in entropy, internal energy and enthalpy. Assume nitrogen to be ideal gas. Take C_p = 1.042 kJ/kg K, C_v = 0.745 kJ/kg K.

d) Explain with neat sketch shell and coil type heat exchanger.

e) Explain with neat sketch forced draught cooling tower.

Marks

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

a) Explain with neat sketch Regenerative feed heating and state any two it's advantages.

b) In a cold storage, the wall measures 3 m × 4 m constructed of brick 10 cm thick, cork stab insulation of 7.5 cm from outside and additional pine wood covering of 2.5 cm thick protecting cover. If the internal temperature is –5°C and outside temperature. is 20°C. Find out heat leakage per unit time. Thermal conductivity for brick is 0.25 W/m°k for cork 0.036W/m°k. and for pine wood 0.092 W/m°K.

c) Calculate the enthalpy of 1 kg of steam of a pressure of 7 bar and dryness fraction 0.8. How much heat would be required to generate 2 kg of this steam from water at 30°C. Take C_{pw} = 4.187 kJ/kg K.

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

a) A reversible engine with 40% efficiency discharges 1520 kJ of heat per minute at 27°C to pond. Find the temperature of source which supplies the heat to the engine and power developed by engine.

b) Differentiate between Jet and Surface condenser.

c) Suggest the type of heat exchangers for following applications. Condenser of refrigeration system. (Household) Dairy plant (Milk chilling plant). Justify your answer.

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