17410

21819

3 Hours / 100 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) 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. a) **Attempt any SIX of the following:** **12**

(i) List the properties of system with examples.

(ii) State Boyle's law.

(iii) Explain Quasi static process of thermodynamic.

(iv) Write the names of any two boiler mountings and two boiler accessories.

(v) Classify cooling towers.

(vi) Define vacuum efficiency of condenser.

(vii) Explain Black body and Gray body.

(viii) State Stefan Boltzman law.

Marks

b) **Attempt any <u>TWO</u> of the following:** **8**

(i) Define energy; prove that energy is a property.

(ii) State Kelvin-plank and clausius statement of second law of thermodynamics.

(iii) Differentiate between Isobaric and Isochoric process. (any four).

2. Attempt any <u>FOUR</u> of the following: **16**

a) Explain the term boiler drought. Why it is necessary?

b) Explain the various losses in steam turbine.

c) Explain the function of steam nozzle? State it's any two applications in industry.

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

e) State the sources of air leakage in condensers.

f) A composite wall is formed of 2 cm copper plate, 3 mm layer of asbestos 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 conducting values as follows

K copper = 370w/mC, K asbestos = 150w/mC,
K fiber glass = 74w/mC.

Marks

3. Attempt any FOUR of the following: **16**

a) One kg of gas at 1.2 bar and 50°C having 1 m^3 volume is heated at constant pressure till its volume becomes 1.8 m^3. Calculate the work done and change in internal energy. Assume Cp = 1.1 KJ/KgK.

b) A heat exchanger is to be selected for pasteurization of milk. Which type of heat exchanger should be selected? Justify your answer.

c) Draw a neat labelled sketch of surface condenser.

d) Discuss the important provision made in IBR.

e) Explain the concept of Mach number.

f) State the function of boiler mounting and accessories.

4. Attempt any FOUR of the following: **16**

a) Represent ideal gas processes on P-V and T-S diagram:

(i) Isothermal process

(ii) Isentropic process.

b) State the characteristic gas constant and universal gas constant.

c) Explain the concept of Generation of steam at constant pressure and represent on T-S diagram

d) State the advantages and disadvantages of superheated steam.

e) List the different types of heat exchangers? Write the application of heat exchangers.

f) Describe the construction of impulse turbine with neat sketch.

Marks

5. Attempt any TWO of the following: **16**

a) What is compounding of steam turbines? List different methods of compounding. Explain any one method.

b) State 'steady state energy equation'. Give the meaning of all parameter contained in it. Apply this equation to boiler, nozzle.

c) Determine the enthalpy, entropy, specific volume and internal energy for one kg of steam at 7 bar if its conditions are:

(i) 85% dry and when

(ii) Superheated up to 100°C assume Cp = 2.1 kJ/kgK for superheated steam. Use steam table.

6. Attempt any TWO of the following: **16**

a) Explain the construction and working of forced and natural draught cooling tower with neat sketch.

b) Discuss the application of second law of thermodynamics on Heat engine and refrigerator.

c) Describe various modes of heat transfer. Give one example for each mode. Also define Transmissivity and Emissivity.

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