17352

21415

3 Hours/100 Marks

Seat No. | | | | | | | | |

Instructions : *(1)* ***All*** *questions are* ***compulsory****.*

(2) ***Illustrate*** *your answers with neat sketches* ***wherever*** *necessary.*

(3) Figures to the ***right*** *indicate* ***full*** *marks.*

(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** : **20**

i) Define a thermodynamic system. Explain its different types.

ii) How heat and work is defined ? State sign conventions used for work and heat transfer with suitable examples.

iii) State steady flow energy equation for generalized case. State meaning of each term in it with proper SI unit.

iv) Draw P-V and T-S diagram for Isobaric and Isochoric gas process.

v) State first law of thermodynamics and its limitations.

vi) Differentiate between heat pump and refrigerator.

vii) Air is compressed from 1 bar and 25°C to 15 bar isentropically in a reciprocating air compressor. Determine temperature at the end of compression and work done per kg of air.

P.T.O.

MARKS

2. Attempt **any four** : **16**

   i) Explain the process of steam formation with the help of T-H diagram.

   ii) Differentiate between boiler mountings and accessories. State different boiler accessories and their functions (any four).

   iii) Classify boilers (any four classifications).

   iv) State advantages and disadvantages of mechanical draught in relation to boiler.

   v) Draw a neat sketch of surface condenser. Label all components.

   vi) State Charle's law and Boyle's law and also write its mathematical equation.

3. Attempt **any four**. **16**

   i) With the help of T-S diagram, explain Rankine cycle.

   ii) State and explain different modes of heat transfer.

   iii) State Fourier's law of heat conduction and derive unit for thermal conductivity.

   iv) For composite wall (two materials) with one surface exposed to air and other surface exposed to water. Write heat transfer equation. For heat transfer per unit area. Draw sketch and assume suitable data.

   v) Define :

      i) Black body

      ii) Gray body

      iii) Absorptivity

      iv) Reflectivity.

   vi) Explain the working of impulse steam turbine with neat sketch.

4. Attempt **any four** : **16**

   i) Explain shell and tube type heat exchanger with neat sketch.

   ii) Classify I.C. engines.

MARKS

iii) Draw valve timing diagram for four stroke petrol engine.

iv) State function of :

i) Carburettor

ii) Turbocharger

iii) Lubricant

iv) Valves in an I.C. engine.

v) Draw a neat sketch of fuel injection pump and state its function in I.C. engine.

vi) Draw diesel cycle on P-V and T-S diagram. Also write equation for air standard efficiency of the cycle.

5. Attempt **any four** : **16**

i) Draw a neat sketch of centrifugal compressor and label its components.

ii) What is multistaging in compressor ? State advantages of multistaging.

iii) Classify compressors.

iv) Define :

i) Refrigeration

ii) Ton of refrigeration

iii) Volumetric efficiency of compressor

iv) Free air delivered in compressor.

v) State any eight applications of heat exchanger.

vi) Draw a neat sketch of force draught cooling tower. Explain its working.

6. a) Attempt **any one** : **8**

i) Draw a neat layout Vapour Compression Refrigeration (VCR) system. Represent VCR cycle on P-V and T-S chart. State function of each component in cycle.

ii) With neat sketch explain the working of two stroke petrol engine.

MARKS

b) Attempt **any two** : **8**

i) 0.2 kg of air with initial pressure and temperature of 1.5 bar and 3000 K is compressed to a pressure of 20 bar isothermally. State work required to compress the air.

ii) An engine working on Otto cycle, has cylinder diameter of 150 mm and stroke of 225 mm. The clearance volume is 1.25×10^{-3} m^3. Find air standard efficiency of cycle.

iii) One face of a copper plate 10 mm thick is maintained at 250°C and other at 40°C. Calculate amount of heat transferred through the plate.
(K= 384 W/mK for copper)
