17352

15116

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 three :** **12**

i) State different modes of heat transfer and differentiate between them with respect to their basic definition.

ii) State Fourier's law of heat conduction. Write its numerical form and hence derive unit for thermal conductivity.

iii) Define

a) Black body b) Absorptivity

c) Transmissivity d) Reflectivity

iv) Classify heat exchangers. State application of each type.

B) Attempt **any two** : **8**

i) One face of copper plate 10 cm thick is maintained at 250°C and the other face is maintained at 40°C. Calculate the amount of heat transferred through the plate. Take K for

copper $384 = \frac{w}{mk}$.

ii) Air at 15°C flows over a hot plate of area 40 cm × 80 cm maintained at 150°C. The heat transfer rate is 1253 W. Calculate heat transfer coefficient.

iii) Define :

i) Stefan's Boltzman law ii) Emissivity.

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

a) State and explain different types of thermodynamic systems with one example each.

b) Define and explain point function and path function in thermodynamics with suitable example.

c) State the two statements of second law of thermodynamics with their names. Also state names of thermodynamic cycles using them.

d) Differentiate between heat engine and refrigerator. State value of universal gas constant with proper unit. Obtain value of characteristic gas constant from universal gas constant for water.

P.T.O.

Marks

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

a) During a thermodynamic process gas is compressed reversibly from 6 m^3 to 1 m^3 following the law $PV^{1.3}$ = constant. Calculate final pressure and work supplied if initial pressure and temperature is 1 bar and 27°C.

b) Find work done and heat transferred during a constant volume process, when air is heated from 35°C to 100°C. Take standard values of air properties. Mass flow rate of air is 60 kg/min.

c) Explain the process of steam formation with T – H diagram.

d) Represent air standard diesel cycle on P-V chart and name all processes. Find temperature at the end of heat addition process if temperature and pressure at start of heat addition process is 825 K and 35 bar respectively.

e) In an Air Standard Otto cycle, suction condition is 1 bar and 26°C. The compression ratio is 8. Determine temperature at the end of compression and air standard efficiency.

f) Explain the working of forced draught cooling tower with neat sketch.

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

a) Differentiate between boiler mounting and accessory. List boiler mountings (any two) and boiler accessories (any two).

b) With neat sketch explain the working of fusible plug.

c) State the purpose of condenser in steam power plant. Draw a neat sketch of surface condenser and label all its components.

d) Draw a neat layout of steam power plant. Label all its components. State the function of cooling tower.

e) With the help of T-S chart explain Rankine cycle of steam generation.

f) Draw neat sketch of centrifugal compressor and explain its working.

5. Attempt **any two** : **16**

a) Draw valve timing diagram for four stroke petrol engine. Show all salient points and explain it.

b) Explain working of simple carburettor with neat sketch.

c) Explain the working of two stroke petrol engine with neat sketch.

6. Attempt **any two** : **16**

a) i) Represent compression of air in reciprocating compressor with clearance. On T-S chart. Show on it clearance volume, stroke volume and volume of air actually sucked.

ii) State advantages of multistage compression.

b) Draw a neat sketch of vapour compression refrigeration cycle. Represent it on P-V and T-S chart. State all processes in it.

c) With the help of T-S diagram, state the effect of subcooling and superheating of refrigerant on performance of vapour compression refrigeration system.
