17352

16172

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. A) Attempt **any three**. **12**

a) What is pure substance ? State the types of properties of system with examples.

b) State : i) Avogadro's law.
ii) Charle's law.

c) Compare jet condenser and surface condenser (any 4 points).

d) Define clearance ratio w.r. to compressor. State the conditions for perfect and imperfect cooling.

B) Attempt **any one**. **6**

a) In a diesel cycle the lowest temperature and lowest pressure are 300°K and 1 bar respectively. The compression ratio is 16 and heat added per kg of air is 2500 kJ/kg. Determine :
i) The temperature and pressure at the end of compression.
ii) Highest temperature reached in cycle.
iii) Air standard efficiency of engine.

b) Explain with neat sketch working of shell and tube type heat exchanger.

2. Attempt **any two** : **16**

a) Write the steady flow energy equation and its application to open system like
i) Boiler ii) Turbine.

b) Draw a layout of steam power plant and explain its working principle.

c) What are the various methods of producing refrigerating effect ? Explain any one.

P.T.O.

Marks

3. Attempt **any two** : **16**

a) A CO_2 gas expands adiabatically from a pressure and volume of 7 bar and 0.03 m^3 respectively to pressure 1.4 bar. Determine

i) Final volume

ii) Workdone

iii) Change in internal energy. Assume

C_p = 1.046 kJ/kg°K and

C_v = 0.752 kJ/kg°K.

b) i) Compare SI and CI engine (any four). **4**

ii) A petrol engine working on otto cycle has compression ratio of 8 and consumes 1 kg of air per minute. If maximum temperature during the cycle is 2000°K and minimum temperature is 300°K. Find the power developed by the engine. **4**

c) A 165 mm external diameter pipe carrying brine is lagged with 35 mm thickness of lagging for which coefficient of conductivity is 0.04 watts/m°c. Outer surface temperature of the lagging is 35°C and brine temperature at a section inside the pipe is –21°C. Find the rise in temperature of the brine per meter length at this section, if the brine flow rate is 0.32 kg/sec. Specific heat of brine is 3.6 kJ/kg°C.

4. A) Attempt **any three** : **12**

a) Explain with neat sketch forced drought cooling tower.

b) Compare centrifugal compressor and axial flow compressor (any four).

c) What are the objectives of supercharging ? State effects of supercharging.

d) State and explain Stefan – Boltzman law of radiation.

B) Attempt **any one** : **6**

a) Define, zeroth law of Thermodynamics and explain Kelvin-Plank statement.

b) What are the modern features of high pressure boilers ? How testing of boilers is carried out ?

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

a) Define positive displacement compressor. Draw and explain working of reciprocating compressor.

b) Draw valve timing diagram of two stroke petrol engine and explain how ignition takes place.

c) i) Define the terms :

i) Absorptivity ii) Transmissivity

iii) Reflectivity iv) Emissivity

ii) Explain the concept of black and gray bodies.

Marks

6. Attempt **any four** : **16**

a) Explain the use of steam tables and charts.

b) Compare impulse turbine and reaction turbine (any four points).

c) Explain the effect of sub-cooling of refrigerant. Draw it on T-s and P-h diagram.

d) Write the advantages and disadvantages of multistaging (two each).

e) Draw a labeled sketch of simple carburettor.

f) Calculate heat loss in kJ/hr or watts from a 20 mm diameter opening electric furnace if it is maintained at a temperature of 1000°C. Assume that the opening acts as a black body and that ambient air is at 27°C. Assume $b = 4.9 \times 10^{-8}$ kJ/hr m^2 °K^4.