21718

3 Hours / 100 Marks   Seat No.

Instructions : (1) *All questions are **compulsory**.*
(2) *Figures to the **right** indicate **full** marks.*
(3) *Assume suitable data, if **necessary**.*
(4) *Mobile Phone, Pager and any other Electronic Communication devices are **not** permissible in Examination Hall.*
(5) ***Use** of Steam tables, logarithmic, Mollier's chart is **Permitted**.*

Marks

1. A) Attempt **any six** :   **12**
   i) List any two renewable and non-renewable energy sources.
   ii) Define :
      i) Point function
      ii) Path function.
   iii) State zeroth law of thermodynamics.
   iv) Explain the term : Degree of superheat.
   v) Write down the application of CNG and LPG (any two).
   vi) Define condenser efficiency.
   vii) Draw Brayton cycle on P-V diagram.
   viii) Give reason for, why we use higher compression ratio for diesel engines.
   ix) Write down any two application of heat exchanger.

   B) Attempt **any one** :   **8**
   i) Explain the working of Babcock and Wilcox boiler with neat sketch.
   ii) Apply second law of thermodynamics to heat pump and refrigerator and derive relation.
   $$\boxed{COP_{Refrigerator} = COP_{H.P} - 1}$$

2. Attempt **any four** :   **16**
   i) Describe the process of formation of steam and give its graphical representation also.
   ii) List the primary requirements of steam generators.
   iii) Represent otto and dual cycle on P-V and T-S diagram.
   iv) Explain working of two stroke S.I Engine with neat sketch.
   v) Find the specific volume, enthalpy and internal energy of wet steam at 18 bar and dryness fraction 0.9.
   vi) An engine working on otto cycle has the following conditions :
      Pressure at the beginning of compression is 1 bar and pressure at the end of compression is 11 bar. Calculate the compression ratio and air-standard efficiency of the engine. Assume $\gamma = 1.4$.

3. Attempt **any four** :   **16**
   i) Describe working of geothermal energy plant with neat sketch.
   ii) Write down the classification of steam turbine.

P.T.O.

Marks

iii) Explain working of solar water heater.

iv) Differentiate between parall flow and counter flow heat exchanger.

v) List different types of heat exchanger and explain any one of them.

vi) Explain concept of perpetual motion machine of kind 1 and kind 2.

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

i) Differentiate between extensive and intensive properties.

ii) Apply steady flow energy equation on following open system :
   i) engine
   ii) turbine.

iii) Explain term natural draught and induced draught in case of cooling towers.

iv) List different types of nozzles with their applications.

v) Define :
   1) Dalton's law of partial pressure
   2) Vacuum efficiency.

vi) Classify I.C. engine on the basis of :
   1) Working cycle
   2) Type of fuel used
   3) Method of ignition
   4) Application.

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

i) Explain construction and working of impulse turbine with neat sketch.

ii) Draw valve timing diagram for 4-stroke S.I. Engine and also differentiate between supercharger and turbocharger.

iii) Find the internal energy of one kg of steam at 14 bar under the following condition :
   i) When steam is dry saturated
   ii) When steam is 0.85 dry
   iii) When temp of steam is 300°C. Take $Cp_s = 2.25 \dfrac{KJ}{KgK}$.

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

i) Define :
   1) Enthalpy
   2) Entropy
   3) Flow work
   4) Internal energy.

ii) Write Kelvin plank and clausius statement of second law of thermodynamics.

iii) Explain following term :
   1) Degree of superheat
   2) Dryness fraction.

iv) Describe construction and working of surface condenser.

v) List different lubricant additives with their uses.

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