# 17406

**16172**

**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) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

**1.** a) **Attempt any SIX of the following:** **12**

(i) Define the term Bio-Mass.

(ii) Write steady flow energy equation and apply it to Nozzle.

(iii) State any two property characteristics for Ideal Gas.

(iv) Define Boiler? State specifications of a typical Cochran boiler.

(v) State any two main differences between a two stroke cycle and four stroke cycle of I.C. Engine.

(vi) Define:

1) Free Air Delivered and

2) Volumetric Efficiency for air compressor

(vii) State the refrigerant used in window air conditioner and its chemical formula.

(viii) State Clausius statement of second law of thermodynamics.

**Marks**

b) **Attempt any TWO of the following:** **8**

(i) State the meaning of Non-conventional power generation system? Explain its importance in the situation of power shortage through out the world.

(ii) Write steady flow energy equation for Turbine, Boiler, Compressor and Condensor.

(iii) Differentiate between Reversible and Irreversible process.

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

a) Draw a labelled, neat sketch and explain in brief. Solar Parabolic concentrating collector.

b) Differentiate between Heat Engine and Heat Pump. (Any four points)

c) Name the following processes for different values of 'n' on PV diagram.

$n = \infty$, $n = 0$, $n = 1$ and $n = \gamma$

d) Classify steam turbine with respect to:

(i) Action of steam over moving blade,

(ii) Expansion stages,

(iii) Pressure of steam entering

(iv) Exhaust steam pressure

e) Explain with the help of diagram the Ignition system for a spark Ignition Engine.

f) State the advantages of two stage compression over single stage compression for the same pressure ratio.

**Marks**

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

a) State the advantages and limitations of wind energy.

b) A gas of certain mass is expanded from an initial state of 400 KPa and 0.04$m^3$ to another condition of 120KPa and 0.1 $m^3$. The temp fall was observed to be 146°C. If the value of specific heat at constant pressure and volume are 1.0216 kJ/Kg°K and 0.7243 kJ/Kg°K respectively.

Calculate:

(i) Change in Internal energy of the gas.

c) State 'Gay Lussac Law' and 'Avagadro's Law'.

d) Differentiate between fire tube boiler and water tube boiler.

e) State methods of cooling I.C. Engine and merits and demerits of each.

f) Explain working of two stage air compressor and represent it on PV diagram.

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

a) State the first law of thermodynamics for closed system with cyclic process and closed system with non-cyclic process. State two limitation of first law of thermodynamics.

b) A certain quantity of air has a volume of 0.028$m^3$ at a pressure of 1.25 bar and 25°C. It is compressed to a volume of 0.0042$m^3$ according to the law $PV^{1.3} = C$. Calculate the temperature at the end of compression and workdone. The air is brought back to the original temperature after compression by cooling it at constant volume. Calculate its final pressure.

c) State the locations and functions of the following parts in vapour compression system.

(i) Oil Separator

(ii) Receiver

(iii) Accumulator

(iv) Drier cum filter

**Marks**

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

a) Explain with neat sketch working of four stroke petrol engine with actual and theoretical Indicator diagram.

b) Explain construction and working of centrifugal compressor. State its applications.

c) (i) State effect of under cooling in condenser on cop of vapour compression refrigeration system. Show process on P-H chart.

(ii) State effect of superheating of suction vapour on refrigeration system. Show processes on P-H chart.

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

a) A carnot refrigerator requires 1.3 KW/ton. of refrigeration to maintain the temp. of 247K. Find:

(i) C.O.P. of refrigerator

(ii) Temp. at which heat is rejected.

(Take 1 Ton of refrigeration = 3.517 KW)

b) The solids and liquids have one value of specific heat and gases have two values of specific heat. Explain with reasons thereof.

c) Differentiate between Impulse Turbine and Reaction Turbine.

d) Compare the performance characteristic of petrol engine and diesel engine in regard to

(i) Specific fuel consumption

(ii) Thermal efficiency

(iii) Fuel-Air ratio

(iv) Compression ratio

e) State applications of Rotary compressors and Reciprocating compressors.

f) State any four properties of an Ideal Refrigerant.