

# 17406

**21819**

**3 Hours / 100 Marks**

Seat No.

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- 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 SIX of the following:**

**12**

- (i) What do you mean by IC engine?
- (ii) Define non renewable energy source. Give two examples.
- (iii) List different variables that controls properties of ideal gas.
- (iv) Define property. Enlist two types of properties with one example of each.
- (v) List various gas laws which are applicable for behavior of perfect gas.
- (vi) State uses of compressed air (any four).
- vii) Which type of compressor is used at automotive service station?
- (viii) List various applications of vapour compression refrigeration cycle.

P.T.O.

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

- (i) Classify I.C engine on the basis of:
  - 1) Cycle of operation
  - 2) Type of fuel used
  - 3) Method of ignition
  - 4) Method of governing
- (ii) Define system. Differentiate between open system and closed system on the basis of:
  - 1) Mass transfer
  - 2) Energy transfer
  - 3) Example
- iii) Plot the following process on PV and TS diagram
  - 1) Isobaric process
  - 2) Isothermal process

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

- a) Explain ideal and actual port timing diagram of two stroke S.I engine.
- b) Explain with neat sketch geothermal power plant.
- c) State and explain Zeroth law of thermodynamics. Write down its application
- d) 1kg of gas expands at constant pressure from  $0.085 \text{ m}^3$  to  $0.13 \text{ m}^3$  if initial temp of gas is  $22.5^\circ \text{ C}$  find:
  - (i) final temperature
  - (ii) heat transferTake  $C_p = 1.005 \text{ KJ/Kg-K}$
- e) What do you mean by compressor? How are the compressors classified?
- f) What is polytropic process? How does it differ from an adiabatic process?

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

- a) State thermodynamic definition of work. Also differentiate between heat and work.
- b) Differentiate between S.I engine and C.I engine on the basis of:
  - (i) Basic cycle
  - (ii) Introduction of fuel
  - (iii) Compression ratio range
  - (iv) Efficiency
- c) Explain with sketch solar flat plate collector.
- d) Define positive displacement compressor. State four applications of reciprocating compressor.
- e) 1 kg of air at pressure of 7 bar and temperature  $360^{\circ}$  k undergoes reversible polytropic process which may be represented by  $PV^{1.5} = C$ . If final pressure is 20 bar evaluate final specific volume and temperature.
- f) Classify the boilers on the basis of:
  - (i) Content in tube
  - (ii) Position of furnace
  - (iii) Axis of shell
  - (iv) Application

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

- a) With help of neat sketch describe the operation of vapour compression refrigeration cycle.
- b) Define compression ratio and explain with neat sketch operation of four stroke engine used in Maruti 800 car.
- c) Differentiate between reciprocating compressor and rotary compressor (at least eight points).

- 5. Attempt any TWO of the following:** **16**
- a) Discuss whether following processes are reversible or irreversible. Give reasons for your conclusion:
- (i) Water evaporated at constant temperature by adding heat.
  - (ii) Air is expanded slowly against frictionless piston in insulated cylinder. What is check to decide whether given process is reversible or irreversible.
- b) Explain with neat sketch working of Babcock and Wilcox boiler.
- c) Draw a neat diagram of air conditioning system required in winter season. Explain working of different components in circuit.
- 6. Attempt any FOUR of the following:** **16**
- a) Define:
- (i) Internal energy.
  - (ii) Enthalpy also give its S.I unit of both.
- b) Explain with neat sketch working of impulse steam turbine.
- c) A system executes cyclic process during which there are four transfers of heat as given below:
- $Q_{12} = 880 \text{ KJ}$ ,  $Q_{23} = 100 \text{ KJ}$ ,  $Q_{34} = 720 \text{ KJ}$ ,  $Q_{41} = 200 \text{ KJ}$ .  
The work transfer during the processes are  $W_{12} = 60 \text{ KJ}$ ,  
 $W_{23} = -40 \text{ KJ}$ ,  $W_{34} = 80 \text{ KJ}$  find  $W_{4-1}$ .
- d) Attempt the following
- (i) Define entropy state its SI unit.
  - (ii) State limitations of 1<sup>st</sup> law of the thermodynamics.
- e) What is fuel cell? How does it work?
- f) Explain in brief necessity of refrigeration and define refrigeration effect.
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