

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:

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- (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 m^3 to 0.13 m^3 if initial temp of gas is 22.5° 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° 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 1st 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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