

22441

22223

3 Hours / 70 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.

Marks

1. Attempt any FIVE of the following: 10
- a) State Zeroth law of thermodynamics.
 - b) Differentiate between open system and closed system.
 - c) Define fuel and state its types.
 - d) Define
 - i) Dryness fraction
 - ii) Degree of super heat
 - e) State the uses of compressed air.
 - f) Enlist non-conventional energy sources.
 - g) State advantages of solar energy.

P.T.O.

- 2. Attempt any THREE of the following:** **12**
- a) Explain the process of formation of steam from 0°C water with T-H diagram
 - b) Represent following process on P-V and T-S diagram.
 - i) Isobaric process
 - ii) Isothermal process
 - c) Draw neat and labelled sketch of Lamont boiler.
 - d) Explain with neat sketch working of air compressor used in vehicle washing center.
- 3. Attempt any THREE of the following:** **12**
- a) Explain the application of conduction and convection mode of heat transfer in automobile.
 - b) A coal has following composition by mass carbon : 85%, hydrogen : 4%, sulphur : 1%, oxygen : 2% and nitrogen : 1.5% and remaining is ash. Find HCV and LCV of fuel.
 - c) Suggest energy conservation techniques to be used in automobile workshop. Any four points.
 - d) 0.1m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5m^3 . Calculate heat supplied during the process.
- 4. Attempt any THREE of the following:** **12**
- a) Draw P-V and T-S diagram of otto cycle and explain the processes involved in it.
 - b) State any four requirements of good fuel.
 - c) Sketch energy flow diagram for steam boiler.
 - d) State advantages of multistage air compression with P-V diagram.
 - e) State the factors governing the selection of cogeneration system. Write advantages of cogeneration. (any two)

5. Attempt any TWO of the following:**12**

- a) Explain with neat sketch working of calorimeter used for measuring C.V. of solid and liquid fuel.
- b) Draw a neat sketch of two pass down flow surface condenser. Describe its construction and working.
- c) State two strength and two limitations of following power plants in relation to human aspects of environment.
 - i) Solar power plant
 - ii) Geothermal power plant
 - iii) Wind power plant

6. Attempt any TWO of the following:**12**

- a) Compare rotary and reciprocating air compressor on the basis of following points.
 - i) Suitability at low and high discharge
 - ii) Working principle
 - iii) Nature of flow
 - iv) Delivery pressure range
 - v) Maintainance
 - vi) Application
 - b) Steam enters an engine at a pressure of 12 bar with 67°C of superheat. It is exhausted at a pressure of 0.15 bar and 0.95 dry. Find drop in enthalpy of steam.
(Take at 12 bar $h_f = 798.4 \frac{KJ}{kg}$, $h_{fg} = 1984.3 \frac{KJ}{kg}$
at 0.15 bar $h_f = 226 \frac{KJ}{kg}$, $h_{fg} = 2373.2 \frac{KJ}{kg}$)
 - c) Explain how power is saved due to solar water heating system.
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