

22441

12425

03 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.
(8) Use of Steam tables, logarithmic, Mollier's chart is permitted.

Marks

1. **Attempt any FIVE of the following :** **10**
- a) What is an isochoric process ? Plot it on P-V diagram.
 - b) List different types of thermodynamics processes for ideal gas.
 - c) State any four requirements of good fuel.
 - d) Define :
 - i) Sensible heat
 - ii) Latent heat
 - e) Enlist any four applications of compressed air.
 - f) State the classification of sources of energy.
 - g) List any four applications of solar energy.

P.T.O.

2. Attempt any THREE of the following :**12**

- a) Draw a neat sketch of La-mount boiler and label the following components.
 - i) Economizer
 - ii) Evaporator
 - iii) Heater
 - iv) Circulating pump
 - v) Combustion chamber
- b) Gas occupies a space of 0.3 m^3 at pressure of 2 bar and temperature of 77°C . It is heated at constant volume until the pressure becomes 7 bar. Determine :
 - i) Temperature at the end of process.
 - ii) Mass of the gas. Assume, $R = 287 \text{ J/kgK}$
- c) Calculate the enthalpy of 1 kg of steam at a pressure of 8 bar and dryness fraction of 0.8. How much heat would be required to raise 2 kg of this steam from water at 20°C ?
- d) Explain the construction and working of screw compressor.

3. Attempt any THREE of the following :**12**

- a) Explain the different modes of heat transfer.
- b) A sample of coal has the following composition by mass : carbon 75%, Hydrogen 6%, Oxygen 8%, Nitrogen 2.5%, Sulphur 1.5% and Ash 7%. Calculate HCV and LCV of fuel.
- c) Explain importance of energy conservation.
- d) Derive an expression for the work done in the adiabatic process.

4. Attempt any THREE of the following : 12

- a) Represent the otto cycle on P-V and T-S diagram and write equation for air standard efficiency.
- b) Describe with neat sketch construction and working of Bomb calorimeter.
- c) State the factors governing the selection of cogeneration system and write the advantages of cogeneration.
- d) Explain topping cycle system with neat sketch.
- e) Compare reciprocating and rotory air compressor on the basis of –
 - i) Maximum delivery pressure
 - ii) Speed
 - iii) Air supply
 - iv) Size

5. Attempt any TWO of the following : 12

- a) Define calorific value of fuel. Differentiate between HCV and LCV of fuel. Also state which value is used in calculation and why ?
- b) Explain with neat sketch two pass down flow surface condenser. State functions of condenser in steam power plant.
- c) What are the government policies for harnessing the renewable energy ?

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

- a) Define volumetric efficiency and isothermal efficiency.
Enlist factors affecting volumetric efficiency of reciprocating air compressor.
 - 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 the drop in enthalpy in steam.
Assume $C_p = 2 \text{ KJ/KgK}$.
 - c) Explain the working of geothermal power plant with neat sketch. Also write the strengths of geothermal energy.
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