

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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