

17407

**11718**

**3 Hours / 100 Marks**

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
  - (2) Illustrate your answers with neat sketches wherever necessary.
  - (3) Figures to the right indicate full marks.
  - (4) Assume suitable data, if necessary.
  - (5) Use of Non-programmable Electronic Pocket Calculator is permissible.

**Marks**

- 1. (A) Attempt any SIX of the following :** **12**
- (a) List different types of thermodynamic processes for ideal gas.
  - (b) Define dryness fraction and degree of superheat.
  - (c) State necessity of multistaging in air compressor.
  - (d) Define Free Air Delivered. (FAD)
  - (e) List any four applications of gas turbine.
  - (f) State the classification of sources of energy.
  - (g) Define H.C.V. & L.C.V. of fuel.
  - (h) State any four requirements of a good fuel.

**(B) Attempt any TWO of the following :****8**

- (a) Explain the different modes of heat transfer. List any four applications of heat transfer in automobile.
- (b) A steam engine obtains steam from a boiler at a pressure of 15 bar and 0.98 dry. It was observed that the steam lost 21 KJ of heat per kg as it flows through the pipeline, pressure remain constant. Calculate dryness fraction of the steam, at the engine end of the pipeline (Take  $h_f = 844.6$  kJ/kg, &  $h_{fg} = 1945.3$  kJ/kg at 15 bar pressure).
- (c) Explain working principle of turboprop engine with neat sketch.

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

- (a) Represent the Carnot and dual combustion cycle on P-V & T-S diagram & also write equation for air standard efficiency of the same.
- (b) Derive an expression for the work done in the adiabatic process.
- (c) Draw neat & labelled sketch of La-mount boiler.
- (d) State & explain different phases in formation of steam.
- (e) Enlist factors affecting volumetric efficiency of reciprocating air compressor.
- (f) State the advantages of closed gas turbine plant over open type gas turbine plant.

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

- (a) State the classification of air compressor.
- (b) Explain Brayton cycle with P-V & T-S diagram.

- (c) Explain with neat sketch 'Thermal Power Plant'.
- (d) Define ultimate analysis & proximate analysis of coal, explain how sampling of coal is done in boiler trial.
- (e) Explain with neat sketch closed cycle gas turbine.
- (f) A sample of coal has the following composition by mass carbon 75%, hydrogen 6%, oxygen 8%, nitrogen 2.5%, sulphur 1.5% & ash 7%. Calculate its higher & lower calorific values per kg of coal.

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

**16**

- (a) Derive relation between P, V & T during adiabatic process.
- (b) Attempt the following :
  - (i) Explain the working of geothermal power plant with a neat sketch.
  - (ii) Compare solid fuel & gaseous fuel (any four points)
- (c) Describe with neat sketch construction & working of Bomb calorimeter. Write Dulong's formula & state its use.

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

**16**

- (a) Explain with neat sketch construction & working of pressurized water reactor. List any four parameters for site selection of nuclear power plant.
- (b) Explain with neat sketch two pass down flow surface condenser. State functions of condenser in steam power plant.
- (c) (i) Explain the construction & working of screw compressor.  
(ii) Differentiate between centrifugal & axial flow compressor.

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

- (a) State the air standard efficiency of Otto & diesel cycle.
  - (b) Explain the sources of air leakage in condenser.
  - (c) Define following terms in relation to compressor :
    - (i) I.P.
    - (ii) B.P.
    - (iii) Volumetric efficiency
    - (iv) Compressor efficiency
  - (d) Explain construction & working of turbojet engine with neat sketch.
  - (e) Compare reciprocating & rotary air compressor on the basis of
    - (i) maximum delivery pressure
    - (ii) speed
    - (iii) air supply
    - (iv) size
  - (f) Give classification of gas turbines.
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