

17407

16172

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) Assume suitable data, if necessary.
  - (5) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
  - (7) Use of steam tables, logarithmic, Mollier's chart is permitted.

**Marks**

1. (A) Attempt any SIX of the following :

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- (a) Define entropy & enthalpy.
- (b) Define dryness fraction and degree of superheat.
- (c) Give classification of compressors.
- (d) Enlist any four applications of compressed air.
- (e) Plot P-V & T-S diagram for open cycle gas turbine.
- (f) Give classification of renewable sources of energy.
- (g) List any four merits of liquid fuels over gaseous fuels.
- (h) Enlist any four types of gaseous fuels.

- (B) Attempt any TWO of the following :** **08**
- (a) Represent the Carnot cycle on P-V & T-S diagram and write equation for air standard efficiency.
  - (b) Explain latent heat and sensible heat.
  - (c) Give classification of Gas turbines.
- 2. Attempt any FOUR of the following :** **16**
- (a) Plot the Isobaric process with help of P-V & T-S diagram. Write formulae for work done and internal energy.
  - (b) Differentiate between conduction and convection.
  - (c) Draw neat labelled sketch of 'La-Mont Boiler'.
  - (d) Draw neat labelled sketch of three pass packaged type boiler.
  - (e) Define the following :
    - (i) Capacity of compressor
    - (ii) Volumetric efficiency
    - (iii) Piston displacement
    - (iv) Compressor efficiency
  - (f) Give comparison of open cycle and closed cycle gas turbine.
- 3. Attempt any FOUR of the following :** **16**
- (a) Describe working of two stage reciprocating air compressor.
  - (b) Explain with neat sketch turbojet engine.
  - (c) Draw neat labelled sketch of nuclear power plant.

- (d) Explain the importance of non-conventional power generation system in the present situation of power shortage throughout the world.
- (e) Compare ultimate analysis and proximate analysis of solid fuels.
- (f) During a boiler trial the coal analysis on mass basis was reported as :
- $C = 62.4\%$ ,  $H_2 = 4.2\%$ ,  $O_2 = 4.5\%$ , Moisture – 15% & ash – 13.9%.

Calculate minimum air required to burn 1 kg of coal. Also calculate higher and lower calorific value.

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

**16**

- (a) Describe construction of a thermal power plant with neat sketch and explain its working. What are the parameters to be taken into account for site selection of thermal power plant ?
- (b) Describe with neat sketch construction and working of Bomb calorimeter. Write Dulong's formula and state its use.
- (c) Attempt the following :
- (i) Explain the tidal power plant.
- (ii) Explain H.C.V. & L.C.V. of fuels.

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

**16**

- (a) Derive the equation for air standard efficiency of diesel cycle.
- (b) Determine the quantity of heat required to produce 1 kg of steam at a pressure of 6 bar at a temperature of 25 °C, under the following conditions :
- (i) When steam is wet having a dryness fraction 0.9.
- (ii) When steam is dry saturated.

**P.T.O.**

(iii) When it is superheated at a constant pressure at 250 °C.

(Take  $C_p = 2.3 \text{ kJ/KgK}$ )

For  $P = 6 \text{ bar}$ ,  $h_f = 670.4 \text{ kJ/kg}$ , and

$h_{fg} = 2085 \text{ kJ/kg}$  and  $t = 158.8 \text{ °C}$ .

(c) Explain construction and working of screw compressor. Differentiate between centrifugal and axial flow compressor.

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

**16**

- (a) Explain the adiabatic process with help of P-V & T-S diagram.
  - (b) Enlist sources of air leakage in condenser and define condenser efficiency.
  - (c) Enlist factors affecting volumetric efficiency of reciprocating air compressor.
  - (d) Explain construction and working of turbo-prop engine.
  - (e) Draw Brayton cycle on P-V & T-S diagram and write equation of thermal efficiency.
  - (f) What is multi-staging ? State necessity of multistaging and intercooling of compressors.
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