

22562

23242

3 Hours / 70 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.
  - (6) 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 the assumptions made for air standard cycle.
- (b) Define COP of refrigerating unit.
- (c) Define Mean Effective Pressure (MEP).
- (d) Define the term : (i) Compression Ratio (ii) Free Air Delivery (FAD).
- (e) Give any four applications of gas turbines.
- (f) Enlist fuels used in gas turbines (any four fuels).
- (g) State the equation of thermal efficiency of Carnot cycle and state the meaning of each term involved in it.



- 2. Attempt any THREE of the following : 12**
- (a) Explain MPFI with neat sketch.
  - (b) Define following for IC engine :
    - (i) IP
    - (ii) BP
    - (iii) Mechanical efficiency
    - (iv) BSFC
  - (c) Give the classification of air compressors.
  - (d) Explain working of Turbo Prop engine with neat sketch.
- 3. Attempt any THREE of the following : 12**
- (a) Explain working of EGR with neat sketch.
  - (b) Explain with neat sketch two way catalytic converter.
  - (c) Explain the effect of superheating on the performance of vapour compression cycle.
  - (d) In an ideal Otto cycle, the air at the beginning of the isentropic compression is at 1 bar and 150 °C. The compression ratio is 7. If the heat added during the constant volume process is 200 kJ/kg. Determine : (i) Maximum temperature in the cycle (ii) Air standard efficiency.
- 4. Attempt any THREE of the following : 12**
- (a) Name any four sensors used in I.C. engines and explain working of any one.
  - (b) Draw actual valve timing diagram of 4-stroke petrol engine.
  - (c) State the any four advantages and disadvantages of vapour compression cycle.
  - (d) Explain two stage air compressors with perfect intercooling.
  - (e) Draw the schematic diagram of turbojet engine.

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

- (a) A four stroke petrol engine develops 5 kW at 2000 rpm when its mean effective pressure is 7.5 bar. If for the engine,  $L = 1.25 D$ , Find its dimensions.
- (b) Reciprocating air compressor draws 6 kg of air per minute at 250 °C. It compresses the air polytropically and delivers it at 1050 °C. Find the work required for the compression and air power. Also find mechanical efficiency, if shaft power is 14 kW. Assume  $R = 0.287 \text{ kJ/kg K}$  and  $n = 3$ .
- (c) Draw neat labelled sketch of window air conditioner.

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

- (a) The following observations were made while taking trial on a single cylinder I.C. engine :  
Brake power = 45 kW, mechanical efficiency = 80 percent, brake thermal efficiency = 35 percent, calorific value of fuel = 42000 kJ/kg.  
Determine : (i) Indicator power (ii) Fuel consumption
  - (b) A single cylinder reciprocating compressor has a bore of 120 mm and a stroke of 150 mm and is driven at a speed of 1200 rpm. It is compressing  $\text{CO}_2$  gas from a pressure of 120 KPa and the temperature of 200 °C to a temperature of 2150 °C. Assuming polytropic compression with  $n = 1.3$ , no clearance and volumetric efficiency of 100%, Calculate (i) Pressure Ratio (ii) Indicated Power (iii) Shaft power with mechanical efficiency 80%, (iv) Mass flow rate
  - (c) Draw the layout of ice plant. Name all important components of it and explain its working in brief.
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