11920

3 Hours / 70 Marks   Seat No.

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) Use of psychrometric chart is allowed.

Marks

1. **Attempt any FIVE of the following :**   **10**
    (a) List diagnostic tools used in fault finding of MPFI engines.
    (b) Define SEER & EER.
    (c) State purpose of Selective Catalytic Reduction (SCR).
    (d) Define Pressure Ratio in air compressors.
    (e) List at least six components of a jet engine.
    (f) List different liquid propellants used in rocket engines.
    (g) State four objectives of supercharging.

2. **Attempt any THREE of the following :**   **12**
    (a) Draw actual indicator diagram for 4 stroke petrol engine.
    (b) Draw a typical graph indicating changes in pollutants level (HC, CO_2 & CO) with respect to changes in air fuel ratio.
    (c) Describe in brief working of axial flow compressor with sketch.
    (d) Explain in brief aero derivative & heavy frame engine. State their applications separately.

3. **Attempt any THREE of the following :**   **12**
    (a) List changes made by automobile manufactures in achieving BS VI norms in diesel engines.
    (b) Discuss in brief process of combustion in SI engines with a sketch.
    (c) Explain working of a storage type water cooler with a sketch.
    (d) In otto cycle compression ratio is 8. Calculate air standard efficiency. Will it be grater than Carnot Cycle ? Justify your answer.

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

   (a) Draw inline fuel injection pump. Name different components.

   (b) With sketch, justify use of Variable Geometry Turbocharger as compared to fixed geometry turbocharger.

   (c) State formulae to calculate TEWI & LCCP.

   (d) Draw PV diagram for working of two stage reciprocating air compressor when inter-cooling in perfect and imperfect.

   (e) Compare turbojet & turboprop engines (at least four parameters).

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

   (a) A two stroke cycle internal combustion engine has a mean effective pressure of 5.8 bar. The speed of the engine is 940 rpm. If the diameter of piston and stroke are 120 mm and 130 mm respectively, find the indicated power developed and piston speed.

   (b) A single acting reciprocating air compressor has cylinder diameter and stroke of 201 mm & 301 mm respectively. The compressor sucks air at 1 bar and 27 °C and delivers at 8 bar while running at 101 rpm. Find indicate power of compressor, mass of air delivered by compressor per minute. Compression follows law $PV^{1.25} = C$ Take R = 287 J/kg K.

   (c) In a typical refrigeration system refrigerating effect of 9.5 Tons of refrigeration is expected. Enthalpy values of refrigerant per kg at various locations are 185 kJ (compressor inlet), 206 kJ (compressor outlet), 70 kJ (condenser exit). Assuming no under cooling & superheating find mass of refrigerant per second required to be circulated. Also find COP of the system.

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

   (a) A 4 cylinder, 4 stroke petrol engine has 5 cm bore and 8 cm stroke. It was tested at constant speed. Fuel consumption was 0.13 kg/min. Spark plugs for four cylinders were cut one after other. Brake Power was measured and was found as follows :

   When all cylinders working = 16.25 kW, first cylinder cutoff = 11.55 kW, second cylinder cutoff = 11.65 kW, third cylinder cutoff = 11.70 kW, fourth cylinder cutoff = 11.50 kW. Find IP & Mechanical Efficiency.

   (b) Compare reciprocating and rotary air compressor (at least six points).

   (c) Expected room conditions are 20 °C & 55% RH. Outdoor conditions are 39 °C and RH 70%. Locate both points on psychrometric chart and find how much enthalpy per kg of air and moisture content per kg of dry air need to be changed to achieve room conditions. Draw skeleton of psychrometric chart and show both points.

—————