11920

3 Hours / 100 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)   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 THREE :**   **3 × 4 = 12**

(a)   Draw P-V & T-S diagram for Otto cycle. Name the processes involved in it.

(b)   Define following terms related to compressor :

(i)   Compression ratio

(ii)   Free Air Delivered.

(c)   Give applications of compressed air.

(d)   Draw valve timing diagram of four stroke diesel engine.

    (B) **Attempt any ONE :** 1 × 6 = 6

       (a) "Morse Test cannot be conducted for single cylinder Engine" – explain. Explain motoring test.

       (b) Explain with neat sketch constructional features of 'Three way catalytic converter'.

2. **Attempt any TWO :** 2 × 8 = 16

    (a) Explain the construction and working of lobe compressor with neat label sketch.

    (b) Represent the following processes on Psychrometric chart :

       (1) Evaporative cooling

       (2) Heating with humidification

       (3) Cooling with dehumidification

       (4) Sensible cooling.

    (c) Four stroke four cylinder petrol engine develops 30 kW at 2500 rpm. The mean effective pressure of each cylinder is 800 kN/m^2 and mechanical efficiency is 80%. Calculate the diameter and stroke of each cylinder if stroke to bore ratio is 1.5. Also, calculate B.S.F.C. if brake thermal efficiency is 28%. The calorific value of petrol is 44000 kJ/kg.

3. **Attempt any FOUR :** 4 × 4 = 16

    (a) List any four pollutants in exhaust goes of I.C. engine with their effects.

    (b) Compare open cycle and close cycle gas turbine.

    (c) Define (i) one ton of refrigeration, (ii) Co-efficient of performance.

(d) List three methods to improve thermal efficiency of gas turbine and explain any one.

(e) Explain battery ignition in S.I. engine.

4. (A) Attempt any THREE : 3 × 4 = 12

(a) Explain in brief constructional features of M.P.F.I.

(b) Define the terms related to I.C. engine :

(i) Indicated power

(ii) Mechanical efficiency

(iii) Brake power

(iv) BSFC

(c) What is scavenging in I.C. engine ? State its types.

(d) The following results were obtained during Morse test of four stroke petrol engine.

(1) Brake power developed with all cylinders working = 18.6 kW.

(2) Brake power developed with cylinder No. 1 cut off = 13.2 kW.

(3) Brake power developed with cylinder No. 2 cut off = 13.34 kW.

(4) Brake power developed with cylinder No. 3 cut off = 13.58 kW.

(5) Brake power developed with cylinder No. 4 cut off = 13.27 kW.

Calculate mechanical efficiency of the engine.

(B) Attempt any ONE : 1 × 6 = 6

(a) Explain working of four stroke petrol engine with neat sketch.

(b) List the additives of lubricants used in S.I. engine and state their advantages.

5. **Attempt any TWO :** 2 × 8 = 16

   (a) Explain with neat block diagram the working of 'vapour absorption cycle' of refrigeration.

   (b) A two stage single acting reciprocating air compressor takes air at the rate of 2 m³/min. Intake pressure and temperature are 1 bar and 27 °C. The air is compressed to final pressure of 10 bar. The compression index is 1.25 and intercooling is perfect.

   Calculate :

   (1) Intermediate pressure.

   (2) Power required to drive compressor.

   (3) The percentage saving in work by compressing air in two stages from 1 bar to 10 bar instead of in single stage.

   (c) Explain construction and working of 'Turbo propeller' with a neat labelled diagram. State any two advantages of Turbo propeller as compared with RamJet.

6. **Attempt any FOUR :** 4 × 4 = 16

   (a) Represent simple vapour compression refrigeration cycle on P-h & T-S chart.

   (b) Write four uses of compressed air.

   (c) An engine working on Otto cycle has temperature and pressure at the beginning of compression as 1.4 bar & 25 °C. Find the compression ratio and air standard efficiency of the cycle if the pressure at the end of compression is 10 bar.

   (d) Draw 'Window air conditioner' with neat sketch and label it.

   (e) Explain reheating method to improve thermal efficiency of gas turbine plant with the help of block diagram.

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