

17529

21819

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.
 - (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** of the following :

12

- (a) Represent P-V & T-S diagram for dual cycle & name the processes involved in it.
- (b) Classify air compressor.
- (c) Enlist any eight uses of compressed air.
- (d) Classify I.C. engines on the basis of
 - (i) Method of cooling
 - (ii) Method of igniting fuel
 - (iii) Use
 - (iv) Number of stroke

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P.T.O.

(B) Attempt any ONE of the following :

6

- (a) A four cylinder, four stroke petrol engine works on a mean effective pressure of 5 bar and engine speed of 1250 rpm. Find the indicated power developed by the engine if the diameter of piston is 100 mm and stroke length 150 mm. Calculate the power available at crank shaft if the mechanical efficiency of the engine is 80%.
- (b) State the function of catalytic converter and explain three way catalytic converter with neat sketch.

2. Attempt any TWO of the following :

16

- (a) Differentiate on any eight point between reciprocating and rotary compressor.
- (b) Explain following Psychrometric processes and represent it on Psychrometric chart :
- (i) Sensible heating
 - (ii) Sensible cooling
 - (iii) Humidification
 - (iv) Heating with humidification
- (c) A four cylinder, 4-stroke petrol engine 6 cm bore & 9 cm stroke was tested at constant speed. The fuel supply was fixed to 0.0014 kg/sec and calorific value of fuel is 42000 kJ/kg. The plug of 4-cylinders were successively short circuited without change of speed. The power measurement were as follows :
- B.P. developed with all cylinders working = 16.25 kW
 B.P. developed when cylinder No. 1 cut off = 11.55 kW
 B.P. developed when cylinder No. 2 cut off = 11.65 kW
 B.P. developed when cylinder No. 3 cut off = 11.70 kW
 B.P. developed when cylinder No. 4 cut off = 11.50 kW
- Find :
- (1) Indicated power of engine.
 - (2) Mechanical efficiency.
 - (3) Relative efficiency on indicated power basis if clearance volume is 60 cm³.

3. Attempt any FOUR of the following : 16

- (a) List the pollutant generated from I.C. engine. State any four effects of pollutants on environment.
- (b) State any four applications of gas turbine.
- (c) State the function of (i) Drier, (ii) Oil separator in vapour compression cycle.
- (d) State the need of scavenging. Draw neat sketch of cross flow scavenging.
- (e) Draw labelled diagram of battery ignition system used in S.I. engine.

4. (A) Attempt any THREE of the following : 12

- (a) What is preignition ? State any four factors responsible for preignition.
- (b) Define following terms related to I.C. engine :
 - (i) Cut off ratio
 - (ii) BSFC
 - (iii) Mean effective pressure
 - (iv) Thermal efficiency
- (c) Explain working of 4-stroke C.I. engine with neat sketch.
- (d) Explain motoring test to determine frictional power of engine.

(B) Attempt any ONE of the following : 6

- (a) List any six additives in lubricant and their advantages used for I.C. engine.
- (b) Explain combustion phenomenon in C.I. engine.

5. Attempt any TWO of the following :**16**

- (a) Explain with neat sketch working of vapour compression refrigeration cycle. Also draw the cycle on P-V and T-S diagram.
- (b) A single acting two stage air compressor with perfect intercooling delivers 5 kg/min of air at 15 bar pressure. Assuming an intake condition of 1 bar & 15 °C and compression process as polytropic with index $n = 1.3$. Calculate the indicated power required and isothermal efficiency of compressor. Take $R = 287 \text{ kJ/kg K}$ for air.
- (c) Explain with neat sketch working of turbojet engine. How it differs from turboprop engine in construction & working.

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

- (a) State the function of following components in simple vapour absorption refrigeration system :
 - (i) Generator
 - (ii) Absorber
 - (iii) Pump
 - (iv) Pressure reducing valve
 - (b) State any four advantages of multistaging of compressor.
 - (c) An engine working on an ideal otto cycle has a clearance volume of 0.03 m^3 and swept volume of 0.12 m^3 . Calculate the air standard efficiency of the cycle.
 - (d) Define the term Air Conditioning. Classify various air conditioning systems.
 - (e) Explain constant pressure open cycle gas turbine with regeneration and intercooling.
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