



# 17529

16172

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.*

- |  | <b>Marks</b> |
|--|--------------|
| <b>1. A) Attempt any three :</b>   | <b>12</b>    |
| a) Enlist uses of compressed air (any four).   |              |
| b) What are the advantages of multistaging ?   |              |
| c) Classify gas turbines (any four).   |              |
| d) Define :  |              |
| i) Tonnage of refrigeration   ii) Coefficient of performance.  |              |
| <b>B) Attempt any one :</b>  | <b>6</b>     |
| a) Give classification of IC engines (any six).  |              |
| b) Explain Morse test.   |              |
| <b>2. Attempt any two :</b>  | <b>16</b>    |
| a) In an Ideal ottocycle the air at the beginning of isentropic compression is at 1.01325 bar and 20°C. The compression ratio is 8. If the heat added during constant volume process is 250 kJ/kg. Determine : |              |
| a) Maximum temperature in the cycle   b) Air standard efficiency   |              |
| c) Work done per cycle                      d) Heat rejected.  |              |
| b) The following data refers to a trial conducted on 4-stroke petrol engine  |              |
| Air-fuel ratio (by mass)                 = 15.5 : 1  |              |
| Heat value of fuel                         = 48000 kJ/kg   |              |
| Mechanical efficiency                   = 82%  |              |
| Air standard efficiency                 = 54%  |              |
| Relative efficiency                      = 70%   |              |
| Volumetric efficiency                   = 80%  |              |
| Speed = 240 rpm  |              |
| Brake power = 75 kW  |              |
| Calculate :  |              |
| i) Compression ratio   |              |
| ii) Indicated thermal efficiency   |              |
| iii) Brake specific fuel consumption.  |              |
| c) Differentiate between reciprocating air compressor and rotary air compressor.   |              |

P.T.O.



- 3. Attempt any four :** **16**
- Represent Brayton cycle on PV and TS diagram. Name the processes completing the cycle.
  - A petrol engine has a cylinder of diameter 60 mm and stroke 100 mm. If the mass of charge admitted per cycle is  $2 \times 10^{-4}$  kg. Find volumetric efficiency of the engine.
  - Explain with neat sketch two way catalytic converter.
  - Differentiate between closed cycle and open cycle gas turbine.
  - Explain the effect of superheating and subcooling on the performance of vapour compression cycle.
- 4. A) Attempt any three :** **12**
- Define :
    - Stroke
    - Bore
    - Piston speed
    - MEP (Mean Effective Pressure).
  - Explain with sketch working of screw compressor.
  - Classify gas turbines on the following basis :
    - Working cycle
    - Application
    - Cycle of operation
    - Fuels
  - Name the refrigerants used for :
    - Water cooler
    - Domestic refrigerator
    - Ice plant
    - Cold storage.
- B) Attempt any one :** **6**
- Explain how the heat balance sheet for an IC engine is prepared ?
  - Explain the working of two stage reciprocating compressor. Show work saved on PV diagram.
- 5. Attempt any two :** **16**
- Explain the working of 4-stroke petrol engine with neat sketch.
  - State the methods used to improve thermal efficiency of gas turbine and explain any one.
  - Draw psychrometric chart with all the property lines and represent following psychrometric processes :
    - Sensible heating
    - Sensible cooling with dehumidification
    - Humidification
    - Dehumidification.
- 6. Attempt any four :** **16**
- The following results were obtained during Morse test on 4 stroke petrol engine  
 Brake power developed when all cylinders are working = 16.2 kw  
 Brake power developed with cylinder no. 1 cut off = 11.5 kw  
 Brake power developed with cylinder no. 02 cutoff = 11.6 kw  
 Brake power developed with cylinder no. 03 cutoff = 11.68 kw  
 Brake power developed with cylinder no. 04 cutoff = 11.5 kw  
 Calculate mechanical efficiency of the engine.
  - What is the necessity of purification of air ? How to remove oil, moisture and dust from air ?
  - Draw the schematic diagram of turbojet engine.
  - Define :
    - WBT
    - DPT
    - DBT
    - Degree of saturation.
  - Explain the working of simple vapour absorption refrigeration system.
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