



17529

11718

3 Hours / 100 Marks

Seat No.

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- Instructions :**
- (1) All questions are **compulsory**.
 - (2) Answer **each** next main question on a **new** page.
 - (3) Illustrate your answers with neat sketches **wherever** necessary.
 - (4) Figures to the **right** indicate **full** marks.
 - (5) Assume suitable data, if **necessary**.
 - (6) Use of Non-programmable Electronic Pocket Calculator is **permissible**.

Marks

1. A) Attempt **any three** :

12

- a) Draw p-v and T-S diagram for Diesel cycle. Name the processes involved in it.
- b) Draw actual valve timing diagram for 4-stroke petrol engine.
- c) Classify air compressors.
- d) Classify gas turbine on the basis of
 - a) Cycle of operation
 - b) Thermodynamic cycle
 - c) Application
 - d) Combustion process

B) Attempt **any one** :

6

- a) Draw a neat labelled sketch of fuel injection pump. Give its function.
- b) Explain regeneration method to improve thermal efficiency of gas turbine with the help of flow diagram and T-S diagram.

2. Attempt **any two** :

16

- a) Reciprocating air compressor draws 6 kg of air per minute at 25°C. It compresses the air polytropically and delivers it at 105°C. Find the work done by the compressor and air power. Also find mechanical efficiency if shaft power is 14 kW. Assume $R = 0.287 \text{ kJ/kg}^\circ\text{K}$ and $n = 1.3$.
- b) Explain vapour compression refrigeration cycle on T-S and p-h charts (for superheated vapour at the end of compression).
- c) The following results were obtained during Morse test on 4-stroke petrol engine.
Brake power developed when all cylinders working = 16.2 kW
Brake power developed when 1st cylinder cutoff = 11.5 kW
Brake power developed when 2nd cylinder cutoff = 11.6 kW
Brake power developed when 3rd cylinder cutoff = 11.68 kW
Brake power developed when 4th cylinder cutoff = 11.57 kW
Calculate mechanical efficiency and friction power.

P.T.O.

3. Attempt **any four** :

16

- a) Explain MPFI with neat sketch.
- b) Differentiate supercharging and turbocharging in I.C. engine.
- c) State the advantages of lubricant additives (any four).
- d) Explain the working principle of turbojet with neat sketch.
- e) State the advantages of closed cycle gas turbine over open cycle gas turbine (any four).

4. A) Attempt **any three** :

12

- a) Define the following w.r.to. I.C. engine.
 - i) Indicated power
 - ii) Brake power
 - iii) Volumetric efficiency
 - iv) BSFC
- b) Explain the term swept volume (V_s) w.r.to.
 - i) I.C. engine
 - ii) Reciprocating air compressor
- c) Draw a neat block diagram of "vapour compression cycle". Show the direction of flow of refrigerant.
- d) Explain w.r.to. dual cycle
 - i) cutoff ratio
 - ii) pressure ratio.

B) Attempt **any one** :

6

- a) What is meant by catalytic converter ? Briefly explain with the help of neat sketch.
- b) Draw superimposed p-v diagram of Otto cycle, Diesel cycle and Dual cycle to compare their efficiencies for same compression ratio (R_c) and heat rejection (Q_r).

5. Attempt **any two** :

16

- a) State the methods to improve efficiency of air compressor. Explain two stage air compressor with perfect intercooling with neat sketch.
- b) State the applications of reciprocating compressor and rotary compressor (4 each).
- c) List out different pollutants in exhaust gases of petrol and diesel engine ? Briefly explain their effects on human beings and environments (atleast four).

6. Attempt **any four** :

16

- a) Explain the following terms :
 - i) Daltons law of partial pressures
 - ii) Relative humidity
 - b) Sketch a psychrometric chart and show the following properties of air on it.
 - i) DBT lines
 - ii) WBT lines
 - iii) Specific volume lines
 - iv) Relative humidity lines
 - c) Draw only a neat labelled sketch of window air-conditioner.
 - d) Enlist different uses of compressed air.
 - e) State the applications of gas turbine (any four).
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