



17529

15162

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** : (3×4=12)
- a) Represent 'Brayton Cycle' on P-V and T-S diagram.
 - b) Define following terms w.r.t. air compressor.
 - i) FAD
 - ii) Compression ratio.
 - c) Enlist different uses of compressed air.
 - d) Draw 'Valve timing diagram for 4-stroke cycle diesel engine.
- B) Attempt **any one** : (1×6=6)
- a) Explain in brief, how 'Morse test' is carried out?
 - b) Explain with neat sketch the constructional features of 'Three Way Catalytic Converter'.
2. Attempt **any two** : (2×8=16)
- a) It is desired to compress 15 m³ of air per minute from 1.0132 bar to 10 bar. Calculate minimum power required to drive the compressor having two stages and compared it the power required for single stage compression. Assume value of index for compression process to be 1.3 for both cases also assume the condition for maximum efficiency.
 - b) Represent following processes on Psychrometric chart.
 - i) Heating with humidification
 - ii) Sensible heating.
 - iii) Sensible cooling
 - iv) Evaporative cooling.
 - c) Following observations were made during a trial on 4-stroke, single cylinder engine running at 240 rpm having brake wheel diameter 1.5 meter.

Duration of trial	30 min.
Fuel consumption	6 liter
C.V. of fuel	42000 kJ/kg
Sp. gravity	0.8
IMEP	550 kPa
Brake load	150 kg
Spring balance reading	15 kg

P.T.O.



Cylinder diameter	30 cm
Stroke length	45 cm
Jacket cooling water	11 kg/min
Temp. rise in jacket water	36°C

Determine :

- i) I.P. and B.P. ii) Heat balance sheet on percentage basis.

3. Attempt any four : **(4×4=16)**

- a) State the norms of Bharat stage III and IV.
- b) Classify gas turbine on the basis of
 - i) working cycle ii) application
 - iii) cycle of operation iv) fuel used.
- c) Enlist the four effects of subcooling on the performance of V.C.C. refrigeration cycle.
- d) What is 'Scavenging' ? List any two types of 'scavenging'.
- e) Explain in brief the importance of 'Super Charging'.

4. A) Attempt any three : **(3×4=12)**

- a) Explain in brief the constructional features of MPFI engine.
- b) An engine has piston diameter 15 cm, length of stroke 40 cm and mean effective pressure 5 bar. Engine makes 120 power strokes per minute. Find mechanical efficiency if brake power is 5 kW.
- c) State any four effect of detonation.
- d) Explain the term w.r.t. I.C. engine.
 - i) Mean Effective Pressure (MEP) ii) Cut off ratio.

B) Attempt any one : **(1×6=6)**

- a) Name any four additives used in lubricants ? State their advantages.
- b) A petrol engine working on constant volume cycle has compression ratio of 8 and consume 1 kg of air per minute, if minimum and maximum temp. during cycle is 300 °K and 2000 °K respectively. Find power developed by engine. Assume $\gamma = 1.4$ and $C_v = 0.71$ kJ/kg °K.

5. Attempt any two : **(2×8=16)**

- a) Explain with neat block diagram the working of 'Vapour Absorption Cycle'.
- b) What do you mean by 'Perfect Intercooling' ? Explain with the help of P.V. diagram.
- c) Explain the working of 'Turbo-Prop' engine with neat sketch.

6. Attempt any four : **(4×4=16)**

- a) State the following term :
 - i) Tonnes of refrigeration ii) COP.
- b) Why majority of air compressors available in the market are multi staged ? Explain.
- c) Represent Carnot cycle on P-V and T-S diagram.
- d) Compare between window air conditioner and split air conditioner (any four).
- e) Explain any one method to improve thermal efficiency of gas turbine with the help of block diagram.