



17529

15116

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.*

Marks

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

12

- a) An engine of diameter 250 mm and 375 mm stroke works on otto cycle. The clearance volume is 0.00263 m^3 , find the air standard efficiency of cycle also sketch the cycle on P-V plane.
- b) State any four industrial uses of compressed air.
- c) Define the following terms related to compressor.
 - i) Compressor capacity
 - ii) Free air delivered
 - iii) Volumetric efficiency
 - iv) Mechanical efficiency.
- d) What is pre-ignition ? State any two factors responsible for pre-ignition.

B) Attempt **any one** :

6

- a) A petrol engine working on otto cycle has compression ratio 8 and consumes 1 kg of air per minute. If maximum temperature during the cycle is 2001 k and minimum temperature is 299 k. Find power developed by engine.
- b) Write any three pollutants in exhaust gasses of petrol and diesel engine with their effects on environment.

2. Attempt **any two** :

16

- a) Compare Reciprocating air compressor and Rotary air compressor mentioning the basis of comparison (any 8 points)
- b) Explain sensible heating and cooling with dehumidification by sketching it on outline diagram of psychrometric chart.

P.T.O.

**Marks**

- c) The following observations were made during the test on an oil engine BP of engine = 31.5 kW, fuel used = 10.5 kg/hr, C.V. of fuel = 43,000 kJ/kg, jacket circulating water = 540 kg/hr, rise in temperature of cooling water = 56°C, water circulated through exhaust gas calorimeter = 545 kg/hr, rise in temperature of water passing through exhaust gas calorimeter = 36°C, temperature of exhaust gas leaving the exhaust gas calorimeter = 82°C, A : F ratio = 19:1, ambient temperature = 17°C, C_p for exhaust gases = 1 kJ/kg°K. Draw up the heat balance sheet on minute basis.

3. Attempt any Four : **16**

- What is catalytic convertor ? Explain two way catalytic convertor with neat sketch.
- Draw constant pressure closed cycle gas turbine on P-V and T-S planes. Name the various processes involved and give its efficiency equation with meaning of each term.
- Draw and explain simple vapour absorption refrigeration system.
- Name the different sensors used in ECU of modern automobile with their application. (minimum 4)
- Explain different stages of combustion in C.I. engine with sketch.

4. A) Attempt any three : **12**

- Explain MPFI system with sketch.
- Define the following related I.C. engine.
 - Indicated power
 - Brake power
 - Brake specific fuel consumption
 - Relative efficiency.
- Draw and explain Battery ignition system.
- Describe the method to measure indicated power of I.C. engine.

B) Attempt any one : **6**

- List the additives of Lubricant used in S.I. engine and state their advantages.
- Explain working of 4 stroke S.I. engine with neat sketch.

5. Attempt any two : **16**

- Explain construction and working of ice plant with neat sketch.
- A pneumatic rock drill requires 10 kg/min of air at 6 bar pressure. Find the power required to drive the single acting single stage reciprocating compressor receiving air at 1 bar and 27°C. Assume mechanical efficiency as 80% and value of index, n as 1.25. Take $C_p = 1.005$ kJ/kgK and $C_v = 0.718$ kJ/kgK for air. Also estimate isothermal efficiency of compression.
- Explain construction and working of turbojet with neat labelled sketch.

6. Attempt any four : **16**

- Represent subcooling and superheating on P-h and T-S diagram in refrigeration also give its effect on C.O.P. of refrigeration.
- Define perfect and imperfect inter-cooling in air compressor and show it by graph also.
- Draw P-V and T-S diagram for dual cycle. Name the processes involved in it.
- Give classification of air conditioning system.
- Compare, closed cycle and open cycle gas turbine (any four point).
- State the different methods used to improve thermal efficiency of gas turbine. Explain any one in brief.