

Total No. of Questions : 8]

SEAT No. :

PA-1317

[Total No. of Pages : 2

[5925] 350

S.E. (Mechanical /Automobile)

APPLIED THERMODYNAMICS

(2019 Pattern) (Semester - IV) (202048)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn whenever necessary.
- 4) Make suitable assumption whenever necessary.
- 5) Scientific calculator is allowed.

Q1) a) Draw neat sketch and explain any three types of fuel injector nozzles used in CI engine. [8]

b) Draw neat sketches of any three types combustion chambers used in SI engines. [9]

OR

Q2) a) What is ignition delay in CI engines? Explain any three factors affecting the ignition delay. [8]

b) Explain with sketch the phenomenon of detonation in SI engine. State any two factors affecting flame speed. [9]

Q3) a) Explain Heat balance sheet with its different component. [9]

b) A single cylinder 4- stroke engine gave the following results while running on full load : Area of indicator card = 300 mm²; Length of diagram = 45 mm, Spring constant = 1.5 bar/mm; Speed of the engine = 400 rpm; Load on the brake = 370 N; Spring balance reading = 55 N; Diameter of brake drum = 1.2 m; Fuel consumption = 2.8 kg/h; Calorific value of fuel = 41800 kJ/kg; Diameter of cylinder = 160 mm; Stroke of piston = 200 mm. Calculate: [9]

- i) Brake power.
- ii) Indicated mean effective pressure.
- iii) Brake specific fuel consumption.
- iv) Brake thermal efficiency.

OR

P.T.O.

- Q4) a)** What is mean by Dynamometer? Explain working of any one type of Dynamometer with the help of neat sketch. [9]
- b)** During a test on a single cylinder, four stroke engine having a compression ratio of 8, following data were recorded: Bore = 12 cm; Stroke = 14.5 cm; Indicated mean effective pressure = 2.5 bar; Dead load on dynamometer, $W = 60$ N; Spring balance readings, $S = 19$ N; Effective radius of the flywheel, $R = 40$ cm; Fuel consumption, $m_f = 1.0$ kg/hr., Calorific value of the fuel used, $C = 42000$ kJ/kg; Speed, $N = 2500$ rpm. Determine its indicated power, brake power, mechanical efficiency, air standard efficiency. [9]

- Q5) a)** Enumerate the various components of IC engine to be lubricated. Explain with neat sketch any one type of lubrication system. [8]
- b)** Explain the need of lubrication of Engine in Automobiles. List down the different Engine components lubricated in the Automobiles. [9]

OR

- Q6) a)** Draw neat, labelled sketch of battery ignition system. List down various parts of battery ignition systems. [8]
- b)** Enumerate the various alternative fuels for IC engines. What are the advantages and disadvantages of LPG as alternative fuel in engine? [9]

- Q7) a)** What are the advantages of multi-staging in reciprocating air compressor? [6]
- b)** Compare rotary compressor with reciprocating compressor. A single stage reciprocating compressor takes 1 m^3 of air per minute at 1.013 bar at 15°C and delivers it at 7 bar according to law $PV^{1.35} = \text{constant}$, and clearance is negligible. [6]
- c)** Calculate: [6]
- Mass of the air delivered per minute
 - Delivery temperature
 - Indicated power
- Take individual gas constant $R = 287 \text{ J/kgK}$

OR

- Q8) a)** Explain with neat sketch multi-stage reciprocating air compressor. [6]
- b)** Explain roots blower compressor with neat sketch. [6]
- c)** A single stage single acting reciprocating air compressor has entering at 1 bar, 20°C and compression occurs following polytropic with index 1.2 up to the delivery pressure of 12 bar. The compressor runs at the speed 240 rpm and has L/D ratio of 1.8 the compressor has mechanical efficiency of 0.88. Determine the isothermal efficiency and cylinder dimensions. Also find out the rating of drive required to run the compressor which admits 1 m^3 of air per minute. [6]

