Total No. of Questions—8]   [Total No. of Printed Pages—3

Seat
No.

[5152]-519

S.E. (Mech./Automo.) (Second Semester) EXAMINATION, 2017

APPLIED THERMODYNAMICS

(2015 PATTERN)

Time : Two Hours   Maximum Marks : 50

N.B. :— (i) Answer **4** questions out of **8**.

(ii) Attempt Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**
Q. No. **5** or Q. No. **6**, and Q. No. **7**. or Q. No. **8**.

(iii) *All* the four questions should be solved in one answer book
and attach extra supplements if required.

(iv) Draw diagrams wherever necessary.

(v) Use of scientific calculator is allowed.

(vi) Assume suitable data wherever necessary.

1. (a) What is heat engine ? Differentiate between internal and external
combustion engine.   [6]

(b) Explain the detonation in SI engine with p-θ diagram. [6]

Or

2. (a) Explain actual engine cycle with at least three losses. [6]

(b) Explain Combustion chambers used in SI engine.   [6]

P.T.O.

3. (*a*) Compare knocking in SI and CI engines. Explain the effect of supercharging and compression ratio on knocking in SI and CI engine with suitable reasons. [6]

(*b*) The following observations were recorded during a test on 4 stroke single cylinder diesel engine. [6]

Bore = 200 mm, stroke = 250 mm, mean effective pressure = 0.6 MPa.

Brake drum diameter = 1.2 m, net brake load = 50 kg, Mean piston speed = 300 m/min. Find :

(*i*) Friction power

(*ii*) Mechanical efficiency.

Or

4. (*a*) What is ignition delay in CI engines ? Explain four factors affecting the ignition delay. [6]

(*b*) In a test of an oil engine under full load condition, the following results were obtained. [6]

Frictional Power = 10 kW, rpm = 1750; fuel used = 15 kg/hr, brake torque = 327.5 Nm, Calorific value of fuel used = 42000 kJ/kg, air supplied = 4.75 kg/min, volume flow rate of cooling water = 14 lit/min, room temperature = 21°C, rise in temperature of cooling water = 45°C, exhaust gas temperature = 400°C.

Cp_w = 4.2 kJ/kg K, Cp_g = 1.23 kJ/kg K,

Find ISFC. Also draw heat balance sheet on kW basis.

5. (*a*) Explain with the help of neat diagram exhaust gas recirculation system. [6]

(*b*) What are the functions of lubrication system ? Explain pressurized lubrication system with neat sketch. [7]

Or

6. (*a*) Discuss the effect of A : F ratio on emission : [6]
1. NO_x, 2. UBHC, 3. CO

(*b*) Explain battery ignition system with neat schematic sketch. [7]

7. (*a*) How to increase the isothermal efficiency of reciprocating air compression ? [6]

(*b*) A two stage reciprocating air compressor takes in air at 1 bar and 300 K. Air is delivered at 15 bar. The intermediate pressure is ideal and intercooling is perfect. The law for compression is $PV^{1.25}$ = C. The rate of dischage is 10 kg/min. [7]
Find :

(*i*) Power required to drive the compressor

(*ii*) Saving in work compared to single stage

(*iii*) Heat rejected in intercooler.

Or

8. (*a*) Draw and explain actual indicator diagram of reciprocating compressor. [6]

(*b*) Determine the size of the cylinders for a single acting single stage compressor consuming 35 kW. Also calculate mean effective pressure. Intake conditions are 1 bar and 15ºC and polytropic index is 1.3, speed is 100 rpm and mean piston speed is 152 m/min, delivery pressure is 6 bar. Also calculate isothermal power. Neglect clearance. [7]