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S.E. (Mech./Autom.) (Second Semester) EXAMINATION, 2019

APPLIED THERMODYNAMICS

(2015 PATTERN)

Time : 2 Hours **Maximum Marks : 50**

Instructions:

i. Answer Q1or Q2, Q3or Q4, Q5 or Q6, Q7 or Q8

ii. Neat diagrams must be drawn wherever necessary.

iii. Figures to the right side indicate full marks.

iv. Assume Suitable data if necessary.

v. Use of scientific calculators is allowed.

Q1. a) Draw the actual valve timing diagram of 4-stroke S. I. Engine and answer the following: **[6]**

i) Why does inlet valve close some degrees after BDC

ii) Why does exhaust valve open some degrees before BDC

b) Draw the schematic diagram of M.P.F.I. system. List down the any four sensors , explain their location and function. **[6]**

OR

Q2. a) Explain the following for an actual S.I. Engine cycle: **[6]**

(i) Effect of spark timing on time loss

(ii) Effect of exhaust valve opening on exhaust blowdown loss

Draw the actual p-V diagrams to support your answer.

b) Compare the effect of engine rpm, turbulence and compression ratio on the 1st and 2nd stage of combustion of S.I. engine in terms of crank angle and milliseconds. **[6]**

Q3. a) With neat sketch explain the construction and working of Compression Swirl type Combustion Chamber in C.I. Engine. **[6]**

b) A single cylinder 4-stroke Engine gave the following results on full load. **[6]**
Area of indicator card= 300 mm2, Length of diagram= 40mm, Spring constant= 1bar/mm, speed of engine= 400 rpm, load on brake = 370 N, spring balance reading= 50N, Diameter of brake drum= 1.2m, fuel consumption= 2.8 kg/h, C.V. Of fuel= 41800 kJ/kg, diameter of cylinder= 160 mm, Stroke of piston= 200 mm.
Calculate: i) Indicated MEP ii) Indicated thermal efficiency iii) Brake power iv) Brake Thermal Efficiency.

OR

Q4. a) Explain in detail the effects of following variables on the 1'st combustion stage of C.I. Engine: **[6]**
Compression ratio, injection advance angle, engine speed, supercharging, initial air temperature and engine rpm.

P.T.O.

b) A gasoline engine working on four stroke develops a brake power of 20.9 KW. A Morse test was conducted on this engine & the brake power obtained when each cylinder was made inoperative by short circuiting the spark plug are 14.9, 14.3, 14.8 & 14.5 respectively. The test was conducted at constant speed of 3000 rpm. Find the indicated power, mechanical efficiency & bmep when all cylinders are firing. The bore of the engine is 75 mm & the stroke is 90 mm. [6]

Q5. a) Explain the variation of HC, CO and NOx emission with respect to air fuel ratio for S.I. engine. [6]

b) Explain the construction and working of Transistor assisted Contact type ignition system with circuit diagram. How does it overcome the drawbacks of conventional ignition system? [7]

OR

Q6. a) How does Positive Crankcase Ventilation system reduce the pollution due to crankcase Blow-by? Explain with diagram. [6]

b) Explain pressurized Cooling system with diagram and state its advantages over conventional cooling system. [7]

Q7. a) Derive the expression for ideal intermediate pressure for two stage single acting reciprocating air compressor working under perfect intercooling condition. What is its effect on discharge temperature, pressure ratio and work required for each stage? [6]

b) A two stage air compressor with perfect intercooling takes in air at 1 bar and 27 °C. The law of compression in both the stages is $pv^{1.3}$ = constant. The compressed air is delivered at 9 bar from the H.P. cylinder to an air receiver. Calculate, per kg of air, (a) minimum work of compression, (b) heat rejected in intercooler, (c) work required for single stage compression to the same delivery pressure. [7]

OR

Q8. a) What is the difference between Fan, Blower and compressor? Explain Root's blower with neat sketch. [6]

b) A two stage single reciprocating air compressor , takes in air 1bar and 20 °C. It discharges air at 40 bar. The temperature rise in inter-cooler is 22 °C. Assume polytropic compression and expansion with n =1.33, perfect inter-cooling with ideal intermediate pressure and calculate (a)Work of compression. (b) % saving in work of compression as compared to single stage. (c) Mass of cooling water required in the inter-cooler per kg of air. Assume Cp = 1.005 kj/kg for air and 4.187 kj/kg for water. [7]