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[4657]-517

S.E. (Mechanical) (Automobile) (Second Semester)

EXAMINATION, 2014

APPLIED THERMODYNAMICS

(2012 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :- (i) Answers to the two Sections should be written in separate answer-books.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of calculator is allowed.

(v) Assume suitable data if necessary.

SECTION I

1. (a) Explain function, material and manufacturing method of the following components : [6]

(1) Piston

P.T.O.

- (2) Cylinder
 - (3) Connecting rod
 - (4) Piston rings
 - (5) Crankshaft
 - (6) Camshaft.
- (b) Draw and explain with neat sketch Simple Carburettor. [6]

Or

2. (a) Draw and explain port timing diagram for 2-stroke petrol engine. [6]

(b) Describe with neat sketch stages of combustion in S.I. Engine with the help of P- θ diagram. [6]

3. (a) Explain with neat sketch common rail diesel injection. [6]

(b) A 4-S cycle petrol engine has 6 single acting cylinders of 7.5 cm bore and 9 cm stroke. The engine is coupled to a break having torque arm radius of 38 cm. At 3300 RPM with all cylinders operating, a net brake load is 324 N. When each

cylinder in turn is cut-off average net brake load produced at the same speed by the remaining 5 cylinders is 245 N. Estimate indicated mean effective pressures. With all cylinders operating, the fuel consumption is 0.3 kg/min. Fuel calorific value 42000 kJ/kg. The jacket water flow rate and temperature rise are 65 kg/min and 12°C. On test the engine is enclosed in thermally and acoustically insulated box, through output drive, water, fuel, air and exhaust connections pass. Ventilation air blown up through the box at the rate of 14 kg/min enters at 10°C and leaves at 55°C, draw a heat account of the engine stating the items as % of fuel. [6]

Or

4. (a) Differentiate between knocking in SI and CI engine. [6]

(b) The air flow to 4 cylinder 4-S gasoline engine was measured by means of 8 cm diameter sharp edge orifice with $C_d = 0.65$. During a test the following data was recorded : [6]

Bore = 10 cm

Stroke = 15 cm

Engine speed = 2500 rpm

Brake power = 36 kW

Fuel consumption = 10 kg/hr

Calorific value of fuel = 42 MJ/kg

Pressure drop across orifice = 4 cm of water

Atmospheric temperature and pressure are 17°C and 1 bar resp.

Calculate :

- (1) Brake thermal efficiency
- (2) Break mean effective pressure
- (3) Volumetric efficiency based on free air condition.

SECTION II

5. (a) Explain in brief significance of Bharat Stage Norms for pollution control. [6]
- (b) Describe with schematic diagram working of starting system. [7]

Or

6. (a) Explain with neat sketch Evaporative Loss Control system. [6]
- (b) Enlist different types of lubrication system and explain with neat sketch wet sump lubrication system. [7]

7. (a) Explain vane type compressor with neat sketch and P-V diagram. [6]
- (b) A reciprocating compressor of single stage, double acting type delivers $20 \text{ m}^3/\text{min}$ when measured at free air condition of 1 bar, 27°C . The compressor has compression ratio of 7 and the conditions at the end of suction are 0.97 bar, 35°C . Compressor runs at 240 r.p.m. with clearance volume of 5% of swept volume. The L/D ratio is 1.2. Determine the volumetric efficiency and dimensions of cylinder and isothermal efficiency taking the index of compression and expansion as 1.25. Also show the cycle on P-V diagram. [7]

Or

8. (a) Explain the methods of improving efficiency of reciprocating compressors. [6]
- (b) A reciprocating compressor of single stage and double acting type is running at 200 r.p.m. with mechanical efficiency of 85%. Air flows into compressor at the rate of $5 \text{ m}^3/\text{min}$ measured at atmospheric condition of 1.02 bar, 27°C . Compressor has

compressed air leaving at 8 bar with compression following polytropic process with index of 1.3. Compressor has clearance volume of 5% of stroke volume. During suction of air from atmosphere into compressor its temperature rises by 10°C . There occurs pressure loss of 0.03 bar during suction and pressure loss of 0.05 bar during discharge passage through valves. Determine the dimensions of cylinder, volumetric efficiency and power input required to drive the compressor if stroke to bore ratio

is 1.5.

[7]