Q. P. Code: 25264

Time: 3 hours **Marks: 80**

Note: 1. Q.No.1 is **compulsory.**
2. Attempt any **Three** question from Q.No.2 to Q.No.6
3. Make suitable assumptions if required

Q.No.1 Solve Any **Four** **(5*4)**

a) The engine of the car has four cylinders of 68 mm bore and 75 mm stroke. The compression ratio is 8. Determine the cubic capacity of the engine and the clearance volume of each cylinder.

b) Factors which decreases knock in C.I. Engines tend to increases knock in SI Engines.

c) What is mean by opposed type and radial type engine?

d) The diameter and stroke length of a single two stroke engine working on the constant volume cycle are 100 mm and 200 mm respectively with clearance volume 2.75liters. When the engine is running at 120 rpm the indicated mean effective pressure was 5bar and gas consumption 8.5 m^3/hr. If the calorific value of the gas used is 16350 kJ/kg.

Find: 1) Air standard efficiency
2) Indicated power developed by the engine and
3) Indicated thermal efficiency of the engine.

e) 'C.I. engine are quality governed and S.I. engine are quantity governed' Justify.

Q.No.2 **a)** John's automobile has a 3 liters SI V6 engine that operates on four stroke cycle at 3600 rpm. The compression ratio is 9.5, the length of connecting rods is 16.6 cm and the engine is square (B =S). At this speed, combustion ends at 20° after TDC. Further the engine is connected to a dynamometer which gives a brake output torque reading of 205 Nm at 3600 rpm. At this speed air enters the cylinder at 85 kPa and 60°C and mechanical efficiency of engine is 85%. Engine is running with air fuel ratio A/F = 15, a fuel heating valve of 44,000 kJ/ kg and combustion efficiency of 97%.Calculate **(14)**

(i) Cylinder bore and stroke length, (ii) Average Piston Speed, (iii) Clearance Volume, (iv) BMEP, (v) IMEP, (vi) FMEP, (vii) Friction power loss,
(viii) Brake specific power, (ix) Brake output per displacement volume,
(x) Fuel flow rate, (xi) Brake thermal efficiency, (xii) Indicated thermal efficiency, (xiii) Volumetric efficiency and (xiv) Mechanical efficiency

b) What are the criteria for a good combustion chamber? Explain with a neat sketches combustion chamber used in S.I. Engine. **(6)**

Q.No.3 **a)** Give brief classification of diesel injection system. Explain any one briefly **(6)**

b) Explain the phenomenon of combustion in C.I. Engines with Pressure – Crank Angle diagram. **(6)**

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c) In a petrol engine working on Otto cycle the temperature and pressure at the start of suction are 57 ^{0}C and 1 bar respectively. The compression ratio is 6, uses a fuel with calorific value of 42 MJ/Kg. The air –fuel ratio is 15:1. Determine the maximum pressure in the cylinder if the index of compression is 1.3 and and C_v for product of combustion = 0.678 + 0.00013 T, Where T is in Kelvin. Compare this value with that obtained when C_v = 0.0717 kJ/kg K **(8)**

Q.No.4 a) Explain the objectives of Supercharging. List the types of supercharger. **(6)**

b) An automobile has a 3.2 Liter, Five cylinder, 4-stroke diesel engine operating at 2400 rpm. Fuel injection occurs from 20° bTDC to 5° aTDC. The engine has a volumetric efficiency of 0.95 and operates with fuel equivalence ratio 0.8. Light diesel is used as fuel. Calculate: (i) Time for one injection and (ii) Fuel flow rate through an injector. Used density of air as 1.181 and $(A/F)_{sto}$ = 14.5. **(10)**

c) What are the harmful effects of Knocking? **(4)**

Q.No.5 a) Differentiate **(Any Two)** **(4*2)**

i) Scavenging and Supercharging. ii) Wet sump and Dry sump lubrication.
iii) Water cooling and Air cooling

b) A carburetor is used for a 4-stroke, 4-cylinder square engine running at 40 rev/s has carburetor venture with 3 cm throat. Assuming the bore to be 10 cm, volumetric efficiency 75%, density of air to be 1.15 and co-efficient of air flow rate to be 0.75. Calculate suction pressure at throat. **(10)**

c) The torque developed by a 2-stroke engine is 100 N-m. What will be the torque developed by a 4-stroke engine keeping all other parameters constant? **(2)**

Q.No.6 a) A six cylinder, 4.8 Lit, supercharged engine operating at 3500rpm, has a overall volumetric efficiency 158%. The supercharger has an isentropic efficiency of 92% and mechanical efficiency is 87%. It is desire that air to be delivered to cylinder at 65°C and 180 kPa, while ambient conditions are 23°C and 98 kPa, index 1.4. Calculate **(12)**

(i) Amount of air required to reduce temperature back to 65°C.
(ii) Engine power lost to run supercharger

b) Explain briefly various methods to control Emission. **(5)**

c) Explain the terms squish, swirl and turbulence with reference to C.I. Engine. **(3)**

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