

Sem V / CBS GS / MECH- / AUTO / ICE / M-J-17

Q. P. Code : 600701

(3 Hours)

Max. Marks: 80

Note:

1. Question No.1 is compulsory.
2. Solve any 3 from remaining 5 questions.
3. Total No. of questions to be attempted are Four
4. Assume suitable data, if necessary.

Q1

- a) What is octane number and cetane number? 5
- b) Explain CRDI and MPFI in brief. 5
- c) State True or False and Justify, that, "The SI Engine is quality governed and CI Engine is quantity governed." 5
- d) Willan's line method of calculation of F.P. is best suitable for SI or CI Engine and why? 5

Q2

- a) Write the requirements of
 - a) Fuel injection systems of CI Engines
 - b) Ignition systems in SI Engines.
 10
- c) An 8-cylinder, four-stroke engine of 9 cm bore and 8 cm stroke with a compression ratio of 7 is tested at 4500 rpm on a dynamometer which has 54 cm arm. During a 10 minutes test the dynamometer scale beam reading was 42 kg and the engine consumed 4.4 kg of gasoline having a calorific value of 44000 kJ/kg. Air 27 °C and 1 bar was supplied to the carburettor at the rate of 6 kg/ min. Find (i) the brake power delivered (ii) the brake mean effective pressure (iii) the brake specific fuel consumption (iv) the brake specific air consumption (v) the brake thermal efficiency (vi) the volumetric efficiency and (vii) the air-fuel ratio. 10

Q3

- a) An experimental four-stroke gasoline engine of 1.7 litre capacity is to develop maximum power at 5000 revolutions per minute. The volumetric efficiency is 75% and the air fuel ratio is 14:1. Two carburettors are to be fitted and it is expected that at maximum power the air speed at the choke is 100 m/s. The coefficient of discharge for the venturi is assumed to be 0.80 and that of main jet is 0.65. An allowance should be made for emulsion tube, the diameter of which can be taken as 1/3 of choke diameter. The gasoline surface is 6mm below the choke at this engine condition. Calculate the sizes of a suitable choke and main jet. The specific gravity of the gasoline is 0.75. p_a and T_a are 1 bar and 300 K respectively. 10
- b) Explain (any two) of the following: 10
 - a) Engine Pollution and the NORMS.
 - b) Alternative fuels
 - c) Losses considered in Fuel-Air cycle

[TURN OVER]

Q4

- a) A four-cylinder, four-stroke diesel engine develops a power of 180 kW at 1500 rpm. The *b.s.f.c.* is 0.2 kg/kWh. At the beginning of injection pressure is 30 bar and the maximum cylinder pressure is 50 bar. The injection is expected to be at 200 bar and maximum pressure at the injector is set to be about 500 bar. 10

Assuming the following:

C_d for injector = 0.7, *S.G.* for fuel = 0.875, Atmospheric pressure = 1 bar,

Effective pressure difference = Average pressure difference over the injection period

Determine the total orifice area required per injector if the injection takes place over 15° crank angles.

- b) Draw and explain the stages of combustion in SI engine and the effect of various Engine parameters on combustion. 10

Q5

- a) A test on a two-stroke engine gave the following results at full load: 10

Speed = 350 rpm

Net brake load = 65 kg

mep = 3 bar

Fuel consumption = 4 kg / h

Jacket cooling water flow rate = 500 kg / h

Jacket water temperature at inlet = 20°C

Jacket water temperature at outlet = 40°C

Test room temperature = 20°C

Temperature of exhaust gases = 400°C

Air used per kg of fuel = 32 kg

Cylinder diameter = 22 cm

Stroke = 28 cm

Effective brake diameter = 1 m

Calorific value of fuel = 43 MJ / kg

Proportion of hydrogen in fuel = 15 %

Mean specific heat of dry exhaust gas = 1 kJ / kg K

mean specific heat of a steam = 2.1 kJ / kg K

Sensible heat of water at room temperature = 62 kJ / kg

Latent heat of a steam = 2250 kJ / kg

Find *ip*, *bp* and draw up a heat balance sheet for the test in KJ/min and in percentage.

- b) With the help of a sketch explain in short the working of carburettor having following arrangements 06

i) Compensating jet ii) Idling Jet

- c) With suitable example/values, prove that, during the Load test of an engine increase in the load increases the mechanical efficiency of the engine. 04

[TURN OVER]

- Q6 Explain any four of the following (any four)
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|---|---|
| a) Supercharging of IC Engine | 5 |
| b) Swirl and its types | 5 |
| c) Requirements of cooling and Lubrication system. | 5 |
| d) Detonation or knocking in SI Engine Vs in CI Engine. | 5 |
| e) The Pollution control treatments of Exhaust gases of Engine. | 5 |
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