Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – WINTER 2013

Subject Code: 161902 Date: 29-11-2013

Subject Name: Internal Combustion Engines

Time: 02:30 pm to 05:00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** The compression ratio of an engine working on Otto cycle is 7 and A: F ratio used is 15:1 and C.V. of fuel used is 40000KJ/kg. The temperature and pressure at the beginning of compression are 47°C and 1 bar. Determine the maximum pressure reached in cycle. The compression follows the law $pv^{1.38}=C$, $C_v=(0.7+ 20 \times 10^{-5}T)$ KJ/kg.K, where T is in K., also determine maximum pressure of cycle if $C_v=0.7$ KJ/kg. K, **07**

(b) A petrol engine consumes 6.8kg/hr. The choke diameter of the engine carburetor is 2 cm. The density of the fuel used is 700 kg/m^3 and A:F ratio of the mixture supplied by the carburetor is 15:1.Determine the carburetor jet diameter if the top of jet is 5 mm above the petrol level in float chamber . Take R=287 Nm/kg-K. The Ambient pressure and temperature are 1 bar and 32^{o}C. Take $C_{da}=0.9$,$C_{df}=0.7$. **07**

Q.2 **(a)** Explain with neat sketch actual valve timing diagram of petrol engine and state reason of early opening of exhaust and late closing of inlet valve. What is meant by overlay? **07**

(b) Explain following terms: burning time loss factor, heat loss factor, pumping and friction loss. **07**

OR

(b) State basic requirements of diesel fuel and discuss suitability of hydrogen as alternate fuel in I.C. engine. **07**

Q.3 **(a)** Explain with neat sketch different devices used to meet the requirements of an ideal carburetor. **07**

(b) Explain different methods of measurement of pollutants in exhaust gases. **07**

OR

Q.3 **(a)** Explain with neat sketch air-less injection system. **07**

(b) Define uniflow engine and discuss its merits over other scavenging system. **07**

Q.4 **(a)** What are the effects of following variables on diesel Knock. **07**

i. Injection timing and rate of fuel infection
ii. Surface to volume ratio of combustion chamber
iii. Turbulence caused in combustion chamber

(b) List basic requirements of a good combustion chamber of S.I. engine. **07**

OR

Q.4 **(a)** Discuss the effects of following factors on knocking tendency of an engine **07**

i. Compression ratio
ii. Spark timing
iii. Flame velocity
iv. Pressure and temperature of mixture at inlet

(b) Define squish, swirl, unidirectional movement and turbulence. Explain their importance in design of C.I. combustion chambers. **07**

Q.5 **(a)** List advantages and disadvantages of Magneto System over battery ignition system. **07**

(b) The following data is referred to a 2-stroke engine running for 20 minutes at full load. **07**

Crank shaft speed=350 RPM. Room temperature=20^{o}C
MEP=3 bar. Exhaust gas temperature=300^{o}C
Net brake load=1.5kg D=20 cm and L=28 cm
Jacket cooling water=160kg Brake drum diameter =1 cm
Water inlet temperature=35^{o}C C.V. of fuel=42000kJ/kg.
Water outlet temperature=60^{o}C C_p (steam)=2.1 kJ/kgK.
A:F ratio by mass =30:1
Steam formed per kg of fuel in exhaust=1.35kg.
C_{pg}(dry gases)=1.01 KJ/kg-K.
Determine: a) Indicated thermal efficiency b) I.S.F.C. and B.S.F.C.
c) Heat balance sheet on % basis.

OR

Q.5 **(a)** Write brief note n Stirling engine **07**

(b) A 4-stroke diesel engine develops 100 KW at 1500 RPM when ambient condition is 1.013bar and 300 K with a volumetric efficiency of 80%.The amount of free air used by the engine is 7 kg/min. Find the bore and stroke of the engine assuming L=D. **07**

This engine is required to operate at an altitude of 3 km and is fitted with a blower for supercharging the engine which is operated directly by the engine. The power required to run the blower is 8 KW. The temperature of the air leaving the supercharger is 53^{o}C. Determine the excess air required to be inducted by the blower to maintain the power output of 100 KW and delivery pressure of the blower.

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