Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: VII Mechanical Engineering

CBCS Regular Examination Nov - Dec 2016

(2ME705/3) I.C. Engines

Time: 3 Hours **Total Marks: 70**

Instruction: (1) All questions are compulsory.
(2) Assume suitable data if necessary.
(3) Figure to the right indicates fully marks.
(4) Scientific calculators is allowed.

Section – I

Que. – 1 **(a)** Describe a requirement of a good combustion chamber for S.I. Engine. Difference between combustion and burning. **[5]**

(b) A Spark plug in S.I. Engine fire 18^0C BTDC. Engine Speed is 1800RPM. It takes 8^0 of crank angle rotation to start combustion and get into flame propagation mode. Flame termination occurs at 12^0C ATDC. Cylinder bore is 8.4 cm. The spark plug is offset 8 mm from center line of the cylinder. Flame front can be approximated as a sphere moving out from spark plug. Calculate:- **[7]**

(a) Effective flame speed during flame propagation.
(b) Engine speed is increase to 3000 RPM. The flame speed (C_f) is proportional to Engine speed (N) such that $C_f \propto 0.85$ N. Calculate how much ignition timing may be advanced. So that flame termination again occurs at 12^0C ATDC.

OR

Que. – 1 **(a)** Differentiate between:- **[6]**

(i) Knocking and Detonation
(ii) Delay Period and Ignition Delay
(iii) Turbulence and Swirl

(b) What is meant by knock rating? How cetane number of a diesel fuel sample is decided? **[6]**

Que. – 2 **(a)** What is the function of lubricating oil? How the lubricated oils are rated? **[5]**

(b) Explain the following with neat sketch :- **[6]**

(a) MPFI (Multi Point Fuel Injection) System
(b) Spark Plug

OR

Que. – 2 **(a)** A four stroke gas engine has a bore of 20 cm and stroke of 30 cm and run at 300RPM firing every cycle. If air fuel ratio is 4:1 by volume and volumetric efficiency on NTP base is 80%, determine the volume of gas used per minute. If the calorific value of the gas is $8MJ/m^3$ at NTP and the brake thermal efficiency is 25%, determine the brake power of the engine. **[5]**

(b) Explain eddy current dynamometer in details with neat sketch. **[6]**

Que. – 3 **(a)** Briefly discuss the various efficiency terms associated with an engine. Schematically explain the use of the study of heat balance of an engine. **[8]**

(b) Explain governing methods of I.C. Engine. Give classification of centrifugal governor. **[4]**

Section – II

Que. – 4 (a) Describe suitability of S.I. Engine for Supercharging. Explain the types of Supercharger with neat sketch. [7]

(b) What are the requirements of fuel injection system for C.I. Engine? Also state the methodology of Injection System in C.I. Engine. [5]

OR

Que. – 4 (a) During the trial of single-cylinder, four stroke oil engine, the following results were obtained:- [12]

Bore-20cm, stroke-40cm, Mean effective pressure-6 bar, Oil consumption- 4 kg/hr., Calorific Value of fuel- 43MJ/kg, Cooling water flow rate-4.5 kg/min, Air used per kg of fuel-30 kg, Rise in cooling water temperature-45°C, Temperature of exhaust gases-420 °C, Room Temperature-20 °C, Mean specific heat of exhaust gas -1kJ/kg K, Specific heat of water-4.20kJ/kgK.

Find IP, BP, and draw up a heat balance sheet for the test in kJ/hr.

Torque = 407 N.m , Speed = 250 rpm

Que. – 5 (a) Describe alcohol as an alternative fuel for I.C. Engine and also state its merits and demerits. [5]

(b) Describe the following:- [6]

(i) Variable Compression Ratio Engine.

(ii) Rotary Engine.

OR

Que. – 5 (a) Explain the principle of operation of a three way catalytic convertor with a neat sketch (6)

(b) What do you understand by the term EGR? Explain how EGR reduces NO_x emission. [5]

Que. – 6 (a) A liquid fuels C_7H_{16} (Heptane) is burnt with 50% excess air then stoichiometric air. Assuming complete combustion Calculate [10]

(i) Actual air fuel ratio.

(ii) Volumetric analysis of total exhaust gases.

(b) Draw Valve timing diagram of four stroke petrol and four stroke diesel engine. [2]

END OF PAPER