

Roll No

ME-604 (GS)**B.E. VI Semester**

Examination, December 2017

Grading System (GS)**Internal Combustion Engines***Time : Three Hours**Maximum Marks : 70**Note:* i) Attempt any five questions.

ii) All questions carry equal marks.

- The following data refer to a diesel engine for cold air standard, the compression ratio is 16. The cut off occurs at 5% of the stroke. The mean specific heat at constant volume for the cycle is $0.718 \text{ kJ/kg}^\circ\text{K}$. Assume $R = 0.287 \text{ kJ/kg}^\circ\text{K}$. Knowing that the specific heat increases with temperature. If the mean specific heat C_v for hot air cycle increases by 2%. Calculate the percentage variation in air standard efficiency.
- A dual cycle has compression ratio 15:1. The cut off takes place at 6% of the stroke the maximum pressure obtained is 52 bar. The temperature and pressure at the beginning of compression is 90°C and 1 bar.
 - Calculate the pressure and temperature at all points of the cycle.
 - Calculate also the heat supplied per kg of the working fluid. The specific heat at constant volume is.
 $C_v = 0.718 + 12 \times 10^{-5}T$
 Assume $R = 0.287 \text{ kJ/kg}^\circ\text{K}$.

- Name at least 7 variables affecting detonation in SI engines and also name 7 methods of controlling detonation in SI engines.
- Explain all three theories of detonation i.e. Auto ignition theory, Detonation theory and Accelerated preflame theory in 2-3 line only. Also explain ill effects of detonation on SI engines (minimum 5).
- A single cylinder 4 stroke engine running at 650 rpm uses 2.2 kg/hr of fuel. (Specific gravity of 0.875). It has a single hole nozzle and injection period is 28° of crank travel. If the average injection pressure is 150 bar and average air pressure is 32 bar during injection, Calculate the fuel orifice diameter.
- Calculate the diameter of injector orifice for the following data of a six cylinder four stroke CI engine.
 $BP = 240 \text{ kW}$, $N = 1300 \text{ rpm}$, $bsfc = 0.3 \text{ kg/kwh}$
 Combustion pressure = 36 bar, injection pressure = 200 bar,
 Specific gravity of the fuel = 0.9, coefficient of discharge of the fuel orifice = 0.92, period of injection = 36° of shank angle.
- The venturi of a simple carburetor has a throat diameter of 20mm and flow coefficient of 0.8. The fuel orifice has diameter of 1.14mm and coefficient of fuel flow is 0.65. The gasoline surface is 5mm below the throat calculate:
 - The air fuel ratio for a pressure drop of 0.08 bar when the nozzle tip is neglected.
 - The minimum velocity of air required to start the fuel flow when nozzle tip is provided. Assume the density of air and fuel to be 1.209 kg/m^3 and 750 kg/m^3 respectively.

8. Answer any four of the following:

- a) Draw actual/read cycle of working for SI and CI engines and show on it how it deviates from ideal cycle (P-V analysis only)
- b) Pointedly discuss only "Physical" and "Chemical" aspects of detonation?
- c) Draw neat sketches of various CI engine combustion chambers? (minimum 6)
- d) How fuel metering is done in following cases
 - i) SI engine
 - ii) CI engines
- e) What is Turbo Charging?
- f) Compare turbo charging with super charging (minimum five points of comparison needed).
