

BME 3rd Year 1st Semester Supplementary Examination 2017
Internal Combustion Engines

Time: Three hours**Full Marks: 100**

Answer any five questions. Assume unfurnished data, if any, suitably.

1. a) Derive the expression of thermal efficiency of a Diesel cycle. (10)
 b) In an air standard Otto cycle, the compression ratio is 10 and at the beginning of isentropic compression, the pressure and temperature are 1 bar and 27°C respectively. Heat is added until the temperature at the end of the heat addition process is 1400°C. Calculate (a) heat supplied per kg of air, and (c) the cycle efficiency. (10)
2. a) Draw a typical valve timing diagram of a SI engine with ignition timing (10)
 b) Draw a labeled sketch of a crank case scavenged two stroke engine (10)
3. a) Draw a labeled sketch of a simple float type carburetor. (10)
 b) Sketch the arrangement to provide rich fuel-air mixture in idling zone with labelling (6)
 c) What is Multi Point Fuel Injection in SI engine? (4)
4. a) Draw a labeled sketch of a CI engine injection system showing different components. (6)
 b) Write a short note on Pintle type nozzle (4)
 c) A single cylinder four stroke CI engine uses 3 kg of fuel per hour. The density of fuel is 825 kg/m³. The injection period is 26° of crank angle. If the average injection pressure is 16 MPa and charge pressure during injection is 3 MPa, calculate the diameter of the fuel nozzle assuming a discharge coefficient of 0.85. (10)
5. In a constant speed CI engine, operating on a 4-stroke cycle and fitted with a rope brake, the following observations were recorded: (20)
 Brake wheel diameter = 60 cm; Band thickness = 5 mm; speed = 450 RPM; Load on band (W) = 21 Kgf; spring balance reading (S) = 3 Kgf; area of indicator diagram = 4.15 cm²; length of indicator card = 6.25 cm; spring scale = 11Kgf/cm²/cm. Bore = 10 cm and stroke = 15 cm; specific fuel consumption = 0.22 Kg/BHP. Hr. Heating value of fuel is 42,000 K. J/ Kg. Determine BHP, IHP and mechanical, brake thermal and indicated thermal efficiencies.
 Note that 1 HP=75Kgf.m/sec=746W
6. a) Draw the pressure-crank angle diagram to show a normal combustion process in a CI engine. (4)
 b) State the reason of knocking in CI engines. (6)
 c) State the measures taken to minimize knocking in SI engines. (10)
7. a) Write a short note on Morse test. (8)
 b) Draw a labeled sketch of a battery ignition system. What is the requirement of the capacitor in a battery ignition system? (8+4)