IC ENGINE
(DE/ME-1.1, Dec-07)

Note: Section A is compulsory. Attempt any four questions from Section B and any two from Section C.

Section-A

1. a) What are two basic types of internal combustion engines? What are the fundamental differences between the two?
   b) Sketch Ericsson cycle on P-V and T-S diagram.
   c) What do you mean by delay period? Explain.
   d) Which has a higher sped, a SI engine of a CI engine? Why?
   e) How SI engines fuels are rated?
   f) Why very rich mixture is required for Idling?
   g) Discuss the requirements of an Ideal injection.
   h) Why supercharging of CI engines is done?
   i) What are the various methods for measurement of brake power?
   j) SI engines are made of smaller size, why?

Section-B

2. Define (a) Indicated thermal efficiency. (b) Mechanical efficiency and Brake thermal efficiency. What is the relation between the three?
3. In an Otto cycle at 15° and 1.05 bar is compressed adiabatically until the pressure is 13 bar. Heat is added at constant volume until the pressure rises to 35 bar. Calculate air standard efficiency, the compression ratio and mean effective pressure for the cycle. Take $C_V = 0.718$, $R = 0.287$.
4. What is the importance of delay period? Should the delay period be zero? Discuss variable effecting the delay period.
5. Explain the working of single jet carburetor with suitable sketch. What are its limitations? Discuss.
6. Draw value timing diagram of two stroke and four engines and compare them with the actual.

Section-C

7. The following data were recorded from a test on a single cylinder four stroke oil engine.
   Cylinder bore = 150 mm, Engine stroke = 250 mm, Area of indicator diagram = 450 mm^2, Length of indicator diagram = 50 mm, Indicated spring rating = 1.2 mm, Engine speed = 420 rpm, Brake torque = 217 Nm, Fuel consumption = 2.95 kg/hr, Calorific value of fuel = 44000 Kj/kg, cooling water flow rate = 0.068 kj/kg, Cooling water temp rise = 45° K, Sp. heat capacity of cooling water = 4.188 kj/kg°K.
   Calculate: (a) η_{mech} (b) η_{brake} (c) sfc (d) Draw energy balance diagram
8. "Factors tending to increase detonation in SI engines tend to reduce knock in CI engines" Comment on this statement considering delay period and flames front speed.
9. Show on the graph and discuss the followings.
   (a) Effect of air fuel ratio on power output, efficiency and specific fuel consumption of SI engine.
   (b) Fuel consumption and indicated mean effective pressure curve for various value of A/F ratio.