(3 Hours)   [Total Mark: 80]

N.B. (1) Question No. 1 is compulsory
      (2) Attempt any **Three** Question from Q. No. 2 to Q. No.6
      (3) Make suitable assumption if required
      (4) Illustrate answers with sketches wherever required

Q. 1   Solve any **four** questions from following **(Five marks each)**   20
         a) With neat sketch describe a working of simple carburetor.
         b) Write short note on Multi point fuel injection system for Spark ignition engine
         c) Discuss about the effect of engine variables on detonation in Spark ignition
             engines.
         d) Write short note on SAE rating of lubricants.
         e) Discuss about different methods used for improving engine performance.

Q. 2 (a) Eight cylinder, four stroke engine of 90mm bore and 80mm stroke with a compression   12
           ratio of 7 is tested at 4500 rpm on a dynamometer which has 54cm arm. During a 10
           minute test the dynamometer reading was 42 kg and engine consumed 4.4 kg of
           gasoline having a calorific value 44000 kJ/kg. Air at 27 °C and 1 bar was supplied to
           the carburetor at the rate of 6 kg/min. Determine the (i) Brake Power (ii) Brake Mean
           Effective Pressure (iii) Brake Specific Fuel consumption (iv) Brake Thermal efficiency
           (v) volumetric efficiency (vi) fuel air ratio.

      (b) Explain the working of battery ignition system with neat sketch and also state its merits   08
           and demerits.

Q. 3 (a) A closed type injector has a nozzle orifice diameter of 0.949 mm and the maximum   12
           cross sectional area of the passage between the needle cone and the seat is 1.75 mm^2.
           The discharge coefficient for the orifice is 0.85 and for the passage is 0.80. The injector
           pressure is 175 bar and the average pressure of charge during injection is 25 bar, when
           the needle cone is fully lifted up. Calculate the volume rate of flow per second of fuel
           through the injector and the velocity of jet at that instant. Specific gravity of fuel is
           0.85.

      (b) Explain the effects of engine under cooling and over cooling on engine performance   08

Q. 4 (a) A mechanically coupled super charger is run by four stroke, four cylinder square diesel   12
           engine with a bore of 100mm. Air enters the compressor at 27 ^{o}C and 1bar, which is
           compressed in the compressor up to 1.6 bar. From the compressor air is passed on to a
           cooler, where 1200kJ/min of heat is rejected. Air leaves the cooler at 67°C. Some of the
           air from the compressor is bleed after the cooler to super charge the engine. The
           volumetric efficiency of the engine is 85% based on intake manifold pressure and
           temperature. Other details about the engine are, brake power is 50kW, speed is 3000
           rpm and Mechanical efficiency is 85%. Determine the following parameters;
                i)   Indicated mean effective pressure of the engine
                ii)   Actual air consumption rate of the engine
                iii) Air handling capacity of the compressor in kg/minute
           Take isentropic efficiency of the compressor as 85%

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(b) What are the various types of lubrication system usually used in Internal Combustion engines? Explain any one of them with neat sketch.   08

Q. 5   (a) A four stroke gas engine has a cylinder diameter of 25 cm and stroke 45cm. The effective diameter of the brake is 1.6m. The observations made in the test of the engine were as follows.   12

Duration of the test 40 minute, total number of revolutions = 8080. Total no of explosions = 3230, net load on the brake = 90 kg, mean effective pressure = 5.8 bar, volume of gas used = 7.5 m^3, pressure of gas indicated in meter = 136 mm of water of gauge, atmospheric temperature = 17 °C, calorific value of the gas 19 MJ/m^3 at NTP. Rise in temperature of the jacket cooling water= 45 °C , Cooling Water Supplied 180 Kg. Draw up the heat balance sheet and estimate the indicated thermal efficiency and brake thermal efficiency. Assume atmospheric pressure as 760 mm of Hg

(b) State and explain different factors affecting on ignition delay period in compression ignition engine   08

Q. 6   (a) The following particulars refer to the Morse test on a four stroke four cylinder petrol engine. Cylinder bore x stroke = 60mm x 90mm, rpm = 3000, Fuel Consumption = 4.465 kg/hr, Calorific Value of the fuel = 43 MJ/kg   08

Determine the brake power, indicated power, B.S.F.C, I.S.F.C, and mechanical efficiency.

Condition	All cylinder firing	No.1 cylinder cut-off	No.2 cylinder cut-off	No.3 cylinder cut-off	No.4 cylinder cut-off
Brake torque(Nm)	52.5	37.8	36.7	36.4	37.6

(b) Explain the following (**Four marks each**)   12
  i) Describe briefly about engine pollution and its norms
  ii) Justify requirement of air motion and swirl in Compression ignition engine.
  iii) Discuss about electronic control module and its basic function.

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