Con. 8244–12.   KR–9314

(3 Hours)   [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
           (2) Attempt any **four** out of the remaining questions.
           (3) Assume **suitable** data wherever necessary.
           (4) Figures to **right** indicate **full** marks.

1. (a) State the assumptions made and briefly explain the various losses considered   **5**
         for Fuel-Air cycle analysis.
    (b) Why Morse test is conducted on I.C. Engines ? Describe the process for finding   **5**
         the required parameter and it's limitations.
    (c) Describe Mist Lubrication System.   **5**
    (d) Define the following efficiencies w.r.t. an Internal Combustion Engine.   **5**
         (i)   Mechanical
         (ii)   Brake Thermal
         (iii) Volumetric
         (iv)   Relative
         (v)   Indicated Thermal.

2. (a) With a neat sketch describe Battery Ignition System and explain the importance   **10**
         of each component in detail.
    (b) The following are results of the test conducted on an SI engine for one hour   **10**
         duration : No. of cylinders = 6, Power developed = 80kW, Speed = 3100rpm,
         Capacity of engine = 730cc per cylinder.
         Fuel consumed = 28kg, C.v. of fuel = 44mJ/kg, Air-Fuel ratio = 13. Intake
         temperature = 27°C and Intake Pressure = 0·88 bar. Determine volumetric
         efficiency, Brake thermal efficiency and Brake Torque.

3. (a) Describe in detail various stages of combustion in CI engines.   **8**
    (b) The following data relate to a 4 stroke petrol engine.   **12**
         Capacity of engine = 1489cc, Speed at which max. power is developed =
         4200rpm. Volumetric efficiency at the given speed = 75% A : F = 13 : 1, Theoretical
         air speed at choke = 85m/s, C_d = 0·82 (for venturi), C_d = 0·65 (for petroljet),
         Specific gravity of fuel = 0·74. Level of petrol surface below the throat = 6mm.
         Atmospheric pressure and temperature = 1·013 bar and 20°C respectively. An
         allowance should be made for the emulsion tube, the diameter of which can
         be taken as 40% of the choke diameter. Calculate the sizes of a suitable choke
         and main jet.

4. (a) Describe the individual pump system used in CI engine.   **8**
    (b) In a test of a 4 Cylinder, 4 stroke petrol engine of 45mm bore and 100mm stroke, **12**
         the following results were obtained at full throttle at a constant speed of 2800rpm
         and with fixed setting of fuel supply of 6kg/hr.
         A brake dynamometer is used with a torque arm of 0·37m. The net brake load

[TURN OVER

is 160N. Specific Gravity of fuel is 0·74 and calorific value is 44mJ/kg. Morse test is carried and the cylinders are cut out in the order of 1, 2, 3, 4 with corresponding brake load of 110N, 107N, 104N and 110N respectively. Calculate :

    (i)   Engine Torque
    (ii)   BMEP
    (iii)   Brake Thermal Efficiency
    (iv)   Specific fuel consumption
    (v)   Mechanical Efficiency
    (vi)   Indicated mean effective pressure.

5. (a) Describe any one type of compensating device used in carburettor. **8**

   (b) An 8 cylinder, 4 stroke diesel engine has a power output of 386·4kW at 800rpm. **12** The fuel consumption is 0·25kg/kWhr. The pressure in the cylinder at the beginning of injection is 32 bar and the maximum cylinder pressure is 55 bar. The injection is expected to be set at 207 bar and the maximum pressure at the injector is set to be about 595 bar. Calculate the orifice area required per injector if the injection takes place over 12° Crank angle.
Take Specific Gravity of fuel = 0.85
C_d for injector = 0·6
P_{atm} = 1·013bar
The effective pressure difference is the average pressure difference over the injection period.

6. (a) Describe with neat sketch Thermo Sypton cooling system. **8**

   (b) The following observations were made during the test on oil engine : **12**
B.P. = 31·5kW, Fuel used = 10·5 kg/hr, CV of fuel = 43000 kJ/kg, Jacket water = 540 kg/hr. Rise in temperature of cooling water = 56°C. Exhaust gases are passed through calorimeter for finding heat carried away by exhaust gases.
Water circulated through calorimeter = 454 kg/hr, Rise in temperature of water in calorimeter = 36°C.
Temperature of exhaust gas leaving the calorimeter = 82°C
A : F = 19 : 1, Ambient temp = 17°C
C_p for exhaust gas = 1kJ/kg°k
Draw up heat balance sheet on minute and percentage basis.

7. Write short notes on (any **four**) :— **20**
    (a) Octane No. and Cetane No.
    (b) MPFI
    (c) Wankel Engines
    (d) Nozzles used in CI engines
    (e) SAE ratings of Lubricants
    (f) Stratified charge Engines
    (g) Exhaust Gas Recirculation.