Q. P. Code: 25266

Time: 3 Hours   Marks: 80

NB: - 1) Draw neat sketches whenever necessary.
      2) **Q. No. 1** is compulsory.
      3) Solve any **Three** questions from the remaining **Five** questions.
      4) Assume suitable data wherever necessary.

Q.1   Solve any **five** from following six questions :   **20**

a)   Explain why rich mixture is required at the starting.

b)   Justify - variation in specific heat is responsible for changes in efficiency of air standard efficiency of engine.

c)   In air standard Otto-cycle, the compression ratio is 10. The condition at the beginning of the compression process is 100 kPa and 27 ^{0} C. Heat added at constant volume is 1500 KJ/Kg, while 700 kJ/kg of heat is rejected during the other constant volume process in the cycle. Specific gas constant for air =0.287 kJ/kg K. Find the mean effective pressure (In kPa) of the cycle.

d)   Explain effects of spark advancement and retardation on the engine performance.

e)   Explain that the requirement of air motion and swirl in CI engine combustion chamber is much more stringent that in an SI Engine.

f)   Explain why turbocharged engines may have inferior values of power output and fuel consumption than naturally aspirated engines especially at low speed.

Q.2 **a)** The air fuel ratio of a diesel engine is 29:1 and compression ratio 16:1. The temperature at the end of compression being 900 K. Assume that the combustion begins at the TDC and takes place at constant pressure. Take calorific value of fuel as 42 MJ/Kg. R = 0.287 KJ/kgK, Cv = (0.709 + 0.000028 T) KJ/kgK. Find at what percentage of stroke combustion completes. Show the diesel cycle on PV diagram with state point numbers. **10**

b) A single jet carburetor is to supply 6 kg/ min of air & 0.44 kg/min of petrol of specific gravity 0.74. The air is initially at 1 bar & 27 ^{o} C. Assuming an isentropic coefficient of 1.35 for air, determine
 (i) the diameter of the venturi if the air speed is 90 m/s and the velocity coefficient of venturi is 0.85 (ii) the dia of the jet, if the pressure drops at the jet is 0.8 times the pressure drop at the venturi, and the coefficient of the discharge for the jet is 0.66. **10**

Q.3 **a)** A six cylinder four stroke engine develops 200 KW at 1200 rpm and consumes 0.3 kg/kWh. Determine the size of the single hole injector nozzle if the injection pressure is 160 bar and pressure in combustion chamber is 40 bar. The period of injection is 30° of crank angle. Specific gravity of fuel is 0.85 and orifice discharge coefficient is 0.7. **10**

b) What are the different functions of lubricating system ? State the different lubricating systems used for I C Engines. Explain any one of them. **10**

Q.4 a) A test of one hour duration was conducted on a single cylinder engine having a bore of 300 mm and stroke of 450mm. fuel consumed is 8.8 kg at an average speed of 200rpm. The mean effective pressure of the engine 5.8 bar and calorific value of fuel is 41800 kJ/kg. The brake friction load is 1860 N for a brake wheel of diameter of 1.22 m. Quantity of cooling water consumed during the test is 650 kg with a rise in temperature of 22°C. Draw the heat balance sheet on hourly and percentage basis and also
Calculate: i) Mechanical efficiency , ii) Brake thermal efficiency   **10**

b) Explain the types of combustion chambers used in SI engines and compare them. Why maximum diameter of SI engine combustion chambers is limited ?   **10**

Q.5 a) In a test of a single cylinder 4 stroke diesel engine with bore 400 mm and stroke 450 mm, the following observations were made: **10**
Duration of test = 1 hr
Fuel Consumption = 7.5 kg
Indicated mean effective press = 3.75 bar
Calorific value of fuel = 44500 KJ/Kg
Total Air consumption = 361 kg
Total Revolutions = 12000
Net brake load = 1500 N
Brake drum diameter = 180 cm
Rope diameter = 3 cm
Quantity of cooling water used = 600 kg
Temperature rise = 42 ^{0} C
Exhaust gas temperature =300 ^{0} C
Room Temperature = 20 ^{0} C
Cp for exhaust gases = 1.01 KJ/KgK
Calculate:
1) Mechanical Efficiency 2) Indicated and Brake thermal Efficiency 3)
Draw heat balance sheet on minute basis.

b) With neat sketch explain compression induced swirl and divided combustion chamber. Also state its advantages and disadvantages.   **10**

Q.6 a) Write short note on (**Any four**) :   **20**
  i)   Thermosyphon cooling system
  ii) Exhaust gas recirculation
  iii) Turbo charging v/s supercharging
  iv) Alternative fuels in I C Engine
  v)   Air box method
  vi) VCR Engine

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