TE | AUTO | SEM-V | Choice Based | 2nd half 2018

15/11/18

(3 Hours) [Total Marks: 80]

Note: 1 Q.No.1 is **compulsory.**
2. Attempt any **Three** question from Q.No.2 to Q.No.6
3. Make suitable assumptions if required

Q.No.1 Solve Any **Four** **(5*4)**

a) A 4-stroke petrol engine delivers 40 kW with the mechanical efficiency of 80%. The fuel consumption of the engine is 0.4 kg/kW-hr and air-fuel ratio is 14:1. The heating value of the fuel is 43000 kJ/kg. find
(a)The indicated power, (b) The friction power, (c) The brake thermal efficiency, (d) The fuel consumption per hour and (e) The air consumption per hour

b) State the reasons for efficiency of actual cycle is much lower than the air standard cycle efficiency? List the major losses and differences in actual engine cycle and air standard cycle.

c) Describe briefly Engine Pollution and the Norms.

d) Explain the phenomenon of diesel knock. Compare it with the phenomenon of detonation in SI engines.

e) What is vapors lock? How is it related with ASTM distillation curve of the fuel?

Q.No.2 **a)** Willan's line test is conducted on a constant speed diesel engine operating at 1500 rpm and developing 50 kW power output at full load. The Willan's line may be considered as a straight line upto 60% load, with the slope of the line being 8° (eight degrees). The fuel consumption for this engine is 2.46 kg/h at 10% load. Calorific Value (C.V.) of fuel used is 42 MJ/kg. Evaluate (i) Frictional power (ii) Fuel consumption in kg/h at 60% load. (iii) Brake thermal efficiency at 60% load. (iv) Mechanical efficiency at 40% toad. (v) Brake torque at 40% load. **(12)**

b) Justify the requirement of air motion and swirl in a C. I. Engine combustion chamber is much more stringent than in an S. I. Engine. **(08)**

Q.No.3 **a)** Discuss the advantages and disadvantages of petrol injection system with conventional carburetor system. Explain with diagram multipoint fuel injection system. **(10)**

b) Discuss the use of the biogas as a substitute fuel for S.I. Engine. Mention the modifications required with the engine system. **(10)**

TURN OVER

Q.No.4 **a)** A six cylinder, 4.8 Lit, supercharged engine operating at 3500rpm, has a overall volumetric efficiency 158%. The supercharger has an isentropic efficiency of 92% and mechanical efficiency is 87%. It is desire that air to be delivered to cylinder at 65°C and 180 kPa, while ambient conditions are 23°C and 98 kPa, index 1.4. Calculate **(10)**

(i) Amount of air required to reduce temperature back to 65°C.

(ii) Engine power lost to run supercharger

b) State the types of electronic ignition system and explain Capacitance Discharge Ignition System **(10)**

Q.No.5 **a)** Define pour point and flash point and discuss its importance in selecting the lubricating oil for I.C. Engine. **(05)**

b) In a test of a CI engine under full load condition the following results were obtained: **(15)**

(i) ip =33kW, (ii) bp =27kW, (iii) Fuel used = 8 kg/h, (iv) C.V. of fuel = 43 MJ/kg, (v) Inlet temperature of cooling water = 22°C, (vi) Temperature of cooling water outlet from engine = 75°C

(vii) Temperature of cooling water outlet from calorimeter = 48°C

(viii) Temperature of exhaust gas into calorimeter = 528°C

(ix) Temperature of exhaust gas out of calorimeter = 87°C

(x) Room temperature (ambient temperature) = 24°C

(xi) Cooling water flow rate through engine = 7 kg/mm

(xii) Cooling water flow rate through calorimeter = 12 kg/mm

(xiii) A/F ratio on mass basis = 20 :1

(xiv) Specific heat of water = 4.18 kJ/kg K

Evaluate the following: (1) Specific heat of exhaust gas, from the given data (value not to be assumed). (2) Draw the heat balance sheet on kW and percentage basis (3) Indicated, brake thermal and mechanical efficiencies. (4) Explain how and where you have made use of the First law of Thermo-dynamics in the evaluations above. (5) Write the assumptions made.

Q.No.6 **a)** An automobile has a 3.2 Liter, Five cylinder, 4-stroke diesel engine operating at 2400 rpm. Fuel injection occurs from 20° bTDC to 5° aTDC. The engine has a volumetric efficiency of 0.95 and operates with fuel equivalence ratio 0.8. Light diesel is used as fuel. Calculate: (i) Time for one injection and (ii) Fuel flow rate through an injector. Used density of air as 1.181 and $(A/F)_{sto} = 14.5$. **(10)**

b) List engine management sensors and state its importance. **(10)**
