T.E. (SEM.-V) (CBSGS) (MECHANICAL ENGG.) 01st Dec. 2015
I.C. ENGINEERING 3.00 pm to 6.00 pm

QP Code: **5638**

(3 Hours) **[Total Marks :80]**

Note: 1. Question number one is compulsory
2. Attempt any three out of remaining five questions
3. Assume suitable data wherever necessary and state it clearly

Q1 **Attempt any five of the following** (20)

a) Justify - Variation in specific heats is responsible for changes in efficiency of air standard efficiency of engine.

b) Justify - Progressive increase in richness of air fuel mixture is disadvantage of simple carburettor

c) Justify - While designing SI engine combustion chamber surface to volume ratio should be kept maximum for end gas region

d) Explain how the quantity of fuel to be injected inside combustion chamber of diesel engine is controlled with fuel injection pump?

e) Justify - Lower values of compression ratios are preferred for turbocharged engine

f) Explain how it is possible to lower down NOX emissions from engine with exhaust gas recirculation method?

Q2a) During trial on single cylinder, four stroke oil engine, the following observations were recorded:

Bore and stroke : 300 mm x 450 mm
Duration of trial : 60 min
Engine speed : 220 RPM
Fuel consumption : 7 kg
Calorific value of fuel : 45000 kJ/kg
Indicated mean effective pressure : 5.867 bar
Net brake load : 130 kg
Brake drum diameter : 1650 mm
Total weight of jacketed cooling water : 500 kg
Temperature rise of jacketed cooling water : 40 degree centigrade
Temperature of exhaust gases : 300 degree centigrade
Air consumption : 300 kg
Specific heat of exhaust gases : 1.004 kJ/kgoK
Room temperature : 25°C
Determine: Mechanical efficiency, Indicated and Brake Thermal efficiency and heat balance sheet on minute and percentage basis. **(12)**

b) Write a note on effects of detonation. **(08)**

(TURN OVER)

Q3 a) A four cylinder four stroke engine has a cubic capacity of 1490 cm^3. It develops maximum power at 4200 RPM and air fuel ratio required is 13:1. The air speed at venturi is limited to 90 m/s. The volumetric efficiency of engine is 70%. Nozzle lip is 6 mm and atmospheric pressure and temperatures are 1.013 bar and 293 K. An allowance is to be made for emulsion tube whose diameter should be taken as 1/2.5 of venture diameter. Taking following data, calculate the diameter of venture and nozzle.

Cda = 0.85, Cdf = 0.66 and density of fuel = 740 kg/m3 **(10)**

b) What are the requirements of diesel fuel injection system? Explain air injection system with neat sketch. **(10)**

Q4 a) In an Otto engine pressure and temperature at the beginning of compression are 1 bar and 37°C respectively. Calculate the theoretical thermal efficiency of the cycle, if the pressure at the end of adiabatic compression is 15 bar. Peak temperature during the cycle is 2000 K. Calculate the heat supplied per kg of air, work done per kg of air and the pressure at the end of adiabatic expansion. Take Cv = 0.717 kJ/kg°K and adiabatic index = 1.4. **(10)**

b) With neat sketch explain various types of fuel nozzles used in diesel fuel injection system. **(10)**

Q5 a) What are the effects of engine under cooling and over cooling? With neat sketch explain principal and working of evaporative cooling system. **(12)**

b) What are the interpretations drawn from percentages of HC, CO, CO2 and O2 from engine exhaust? **(08)**

Q6 **Write a short note on (any four)** **(20)**

a) Octane rating of fuel and its determination
b) Comparison between dry sump and wet sump lubrication system
c) Effect of supercharging on thermodynamic cycle
d) SI engine fuel injection systems
e) Stages of combustion in CI engine
f) Stratified charge engine