(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2106   **Roll No.** ☐☐☐☐☐☐☐☐☐☐

B.Tech.

(SEM. V) ODD SEMESTER THEORY EXAMINATION 2012-13

I.C. ENGINES AND COMPRESSORS

Time : 2 Hours   *Total Marks : 50*

Note : *(1) Attempt all questions.*

(2) Assume suitably, any missing data.

1.   Attempt any **TWO** of the following :   **(7×2=14)**

(a)   Answer the following :

(i)   Discuss the effect of dissociation on maximum temperature and power produced by the engine in respect to the A/F ratio.

(ii)   Define octane number, its importance as SI engine fuel property. What are the merits and demerits of using leaded gasoline ?

(b)   Answer the following :

(i)   Discuss the effect of spark advance on the performance of Otto cycle, with the help of P-V diagram.

(ii)   A four stroke diesel engine is operating at 2400 r.p.m. Fuel injection starts 15° before TDC and ends at 5° after TDC. The quantity of fuel injected in a cycle is 400 mg. Find the fuel injection rate in kg/sec. If this engine works on Air Standard

Cycle and compression ratio is 20 and cut-off ratio of 1.75, find the power developed by the engine in kW.

(c) An 8-cylinder, 4-stroke SI engine of 80 mm bore and 100 mm stroke length is tested at 4500 rpm on a dynamometer. The brake torque reading of the dynamometer is 215 N-m. The time for 100 c.c. of fuel consumption is 10 seconds. Calorific value of fuel is 44 MJ/kg. The air consumption of the engine is measured by air-box method having orifice dia = 30 mm, coefficient of discharge for orifice = 0.6 and manometer reading across orifice = 18 cm of Hg column. Density of the fuel is 0.7 gm/c.c. Clearance volume of each cylinder is 65 c.c. Air is supplied to the carburettor at 1 bar and 27°C. Find the brake power, bsfc, A/F ratio, volumetric efficiency and efficiency ratio.

2. Attempt any **TWO** parts out of the following : **(6×2=12)**

(a) A single jet simple carburettor giving air-fuel ratio of 15 : 1, has venturi throat of 3.5 cm diameter, and creates depression of 6.33 cm of Hg at venturi throat. Determine the size of fuel nozzle. Assume coefficient of discharge for air and fuel = 1. Air pressure and temperature at carburettor entrance are 1.013 bar and 16°C respectively. Take density of fuel as 750 kg/m^3, and fuel nozzle is at the same level as that of fuel in fuel chamber.

(b) What is meant by abnormal combustion in S.I. engine ? Explain the phenomenon of knock in S.I. engine. Sketch three combustion chambers that reduce the knocking tendencies.

(c) Why is an ignition system needed in S.I. engine ? Sketch the constructional layout of a battery ignition system and explain its working.

3. Attempt any **TWO** of the following : (6×2=12)

(a) What are the requirements of a C.I. fuel injection system ? Sketch a common rail injection system and explain its working.

(b) Enumerate pollutants emitted from S.I. engine. How can these pollutants be controlled ? Compare gasoline engine with a diesel engine regarding their pollution emission.

(c) Show the various stages of combustion in CI engine on the pressure-crank angle diagram. Also discuss the effect of Engine load, speed, injection timing and cetane number on the delay period in CI engine.

4. Attempt any **TWO** parts of the following : (6×2=12)

(a) (i) Explain the phenomenon of surging and choking of compressors.

(ii) Sketch and explain the working of a thermosyphon cooling system.

(b) (i) Briefly explain working of Root's blower. Compare it with Vane blower.

(ii) Classify various systems of engine lubrication. Explain splash lubrication system.

(c) A two stage air compressor compresses air from 17°C and 1 bar to 60 bar. The air is cooled in the intercooler to 32°C and the intermediate pressure is 7.5 bar. The L.P. Cylinder is 100 mm in diameter, 115 mm in stroke

length. Both L.P. and H.P. Cylinders have same stroke length. Assume law of compression as $PV^{1.3}$ = constant. Volume of air drawn is equal to swept volume of L.P. Cylinder at inlet conditions. Find power requirement of compressor when running at 250 rpm. Also find the diameter of H.P. Cylinder.