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BIMEE-031

DMEVI

01385

Term-End Examination

June, 2012

BIMEE-031 : I.C. ENGINES

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any seven** questions. All questions carry **equal** marks. Use of Calculator is permitted.*

1. (a) State the functions of a carburettor in a petrol engine. Describe a simple carburettor with a neat sketch and also state its limitations. **5+5**

(b) 0.5 kg of air (ideal gas) executes a carnot power cycle having a thermal efficiency of 50 percent. The heat transfer to the air during the isothermal expansion is 40 kJ. At the beginning of the isothermal expansion the pressure is 7 bar and the volume is 0.12 m^3. Determine :

(i) The maximum and minimum temperature for the cycle in K :

(ii) The volume at the end of isothermal expansion in m^3.

2. (a) Explain the following terms as applied to I.C. engines : 5+5

(i) Stroke (ii) T.D.C.

(iii) BDC (iv) Clearance volume

(v) Compression ratio

(b) The minimum pressure and temperature in an Otto cycle are 100 kPa and 27°C. The amount of heat - added to the air per cycle is 1500 kJ./kg.

(i) Determine the pressure and temperature at all points of the air standard Otto cycle.

(ii) Also calculate the thermal efficiency of the cycle for a compression ratio of 8 : 1

3. (a) What are the different kinds of fuels used in an I. C. engine ? Describe the important properties of such kind of fuels. 5+5

(b) A four - stroke eight - cylinder engine is tested while running at 3600 rpm. The inlet air temperature is 15° C and the pressure is 760 mm of Hg. The total piston displacement volume is 4066 cm^3. The air - fuel ratio of the engine is 14 : 1 and b.s.f.c. is 0.38 kg / kWh. Dynamometer reading shows a power output of 86 kW. Find the volumetric efficiency of the engine.

4. (a) Explain why a S.I. engine fails to operate if the air fuel ratio is more than 20 : 1 while a C.I. engine can operate on an air - fuel ratio of even 60 : 1 5+5

(b) A six - cylinder, four stroke diesel engine develops 125 kW at 3000 rpm. Its brake specific fuel consumption is 200 g/kWh. Calculate the quantity of fuel to be injected per cycle per cylinder. Specific gravity of the fuel may be taken as 0.85.

5. (a) What do you mean by pre - ignition ? How can it be detected ? 5+5

(b) A 4 - cylinder four - stroke petrol engine develops 14.7 kW at 1000 rpm. The mean effective pressure is 5.5 bar. Calculate the bore and stroke of the engine, if the length of stroke is 1.5 times the bore.

6. (a) "Compressed natural gas (CNG) is preferable in S.I. engine than C.I engine". Justify the statement. 5+5

(b) A large diesel engine runs on four stroke cycle at 2000 rpm. The engine has a displacement of 25 litres and a brake mean effective pressure of 0.6 MN/m^2. It consumes 0.018 kg/s of fuel (calorific value = 42000 kJ/kg). Determine the brake power and brake thermal efficiency.

7. (a) Explain the scavenging process in two stroke engine. Discuss three scavenging processes used in two - stroke engine. 5+5

(b) Following observations were recorded during a test on a single cylinder engine.
Bore = 300 mm; stroke = 450 mm;
Speed = 300 rpm; i.m.e.p = 6 bar;
net brake load = 1.5 kN; brake
drum diameter = 1.8 m;
break rope diameter = 2 cm.
Calculate :
(i) Indicated power
(ii) Brake power
(iii) Mechanical efficiency.

8. (a) Discuss the three basic requirements of a good S.I. engine combustion chamber. 5+5

(b) Enumerate lubrication systems and explain wet sump lubrication system with the help of a neat sketch.

9. (a) State the advantages and limitation of petrol injection. Explain briefly 'continued' and 'timed' injection systems. 5+5

(b) Why is cooling necessary for I.C. engines ? Why overheating and overcooling of I.C. engines is harmful ?

10. (a) What is the difference between 'ignition timing' and 'firing order' ? 5+5

(b) Explain briefly supercharging of S.I. engines. What are supercharging limits of S.I. engines ?
