No. of Printed Pages : 4 **BME-053**

DIPLOMA IN MECHANICAL ENGINEERING (DME)

Term-End Examination

June, 2011

BME-053 : APPLIED THERMAL ENGINEERING

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **any seven** questions. Scientific non-programmable calculator is allowed.*

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1. (a) Define the following : **4**

(i) Indicated thermal efficiency

(ii) Brake thermal efficiency

(b) A Carnot cycle operates between the temperatures of 30°C and 1147°C with air as the working fluid. The pressure at the beginning of isothermal compression is 1.03 bar and 385 kJ/kg of air of heat are added. **6**

Determine

(i) net work done per kg of air

(ii) cycle thermal efficiency.

(iii) peak pressure in the cycle

(iv) mean effective pressure.

2. (a) What are the requirement of a good carburetor ? **4**

(b) Explain the working of a two stroke petrol engine , with the help of neat diagram. 6

3. (a) List the basic requirements of the fuel injection system suitable for a C.I. engine. 4

(b) Explain the working of a diesel engine fuel injection pump with neat sketch. 6

4. (a) Explain supercharging in an I.C. Engine and its effect on the performance of an I.C. Engine. 5

(b) What is turbulence in an I.C. Engine ? Explain the effect of low and excessive turbulence on Engine performance. 5

5. (a) What are the desirable characteristics of a good fuel ? 4

(b) What are the various lubrication systems used in I.C. Engines ? Explain any one of them with neat sketch. 6

6. (a) Explain how the fuel consumption of an engine is determined in a laboratory testing ? 4

(b) The following observations were made during a trial of a constant speed compression ignition engine operating on the four stroke cycle : 6

Brake wheel diameter = 600 mm

Band thickness = 5 mm

Speed = 450 r. p. m

Load on band = 206 N

Spring balance reading = 3.0 N

Area of indicator diagram = 14.15 cm^2

Length of indicator diagram = 6.25 cm

Spring valve = 108.0 N/ cm^2/ cm

Bore = 100 mm

Stroke = 150 mm

Specific fuel consumption

= 0.295 kg/kW/hr

Heating value of fuel = 41700 kJ/kg

Determine the

(i) Mechanical efficiency

(ii) Brake thermal efficiency

7. (a) How is 'diesel knock' caused ? What are the ways by which this could be avoided ? **4**

(b) A four cylinder four stroke petrol engine working on the otto cycle consumes 7 kg of petrol per hour. The compression ratio of the engine is 5. Determine the thermal and air standard efficiencies. The calorific value of the fuel is 45000 kJ/kg. Determine power developed per cylinder. **6**

8. (a) Derive the expression for the volumetric efficiency of a compressor, in terms of clearance ratio, pressure ratio and index of compression. **5**

(b) A single acting reciprocating compressor has a bore and stroke of 40 cm each and the speed is 300 rev/min. The clearance volume is 1750 cm^3 . The Expansion and compression follow the law $pV^{1.23} = c$. The pressure and temperature at the end of suction are 1 bar and 27° C. Find the mean effective pressure and the indicated power of compressor when the delivery pressure is 7 bar. Find also the volumetric efficiency. 5

9. (a) List the advantages and disadvantages of gas turbines. 4

(b) The air enters the compressor of a gas turbine at atmospheric pressure and temperature 30° C is compressed to 6 bar with an isotropic efficiency of 85%. The turbine inlet temperature is 500° C. The isentropic efficiency of a turbine is 80% Estimate the flow of air in kg/s for a net power of 1470 kW. 6

10. Write short notes of the following : 4x2.5=10

(a) Carburettor (b) Ignition advance

(c) Detonation (d) Scavenging