

**DIPLOMA IN MECHANICAL ENGINEERING
(DME)**

Term-End Examination

June, 2016

00140

BME-053 : APPLIED THERMAL ENGINEERING

Time : 2 hours

Maximum Marks : 70

Note : Answer any seven questions. All questions carry equal marks. Assume any missing data suitably. Use of scientific calculator is allowed.

1. (a) Explain the Rankine cycle and Modified Rankine cycle with P-V diagram. 5
- (b) A gas engine working on Otto cycle has a cylinder diameter of 178 mm and stroke of 254 mm. The clearance volume is $1.5 \times 10^6 \text{ mm}^3$. Calculate the air standard efficiency. 5
2. (a) Explain the working of a 4-stroke petrol engine with a neat sketch. 5
- (b) Compare 2-stroke engine with 4-stroke engine. 5

3. (a) What are gaseous fuels ? List out their merits and demerits. 5
- (b) Explain the working of Battery Ignition system with a neat sketch. 5
4. (a) Explain the working of a Spark plug with a neat sketch. 5
- (b) What is the difference between firing order and ignition timing ? 5
5. (a) Explain the working of thermostat valve in water cooling system. 5
- (b) What is the purpose of fins in air-cooled system ? Write the merits and demerits of an air-cooled system. 5
6. (a) Explain briefly crank-case ventilation. 5
- (b) Name the types of oil filters and explain about cartridge oil filter. 5
7. (a) Explain the principle of working of a Rope Brake Dynamometer. 5
- (b) A 4-cylinder 4-stroke cycle engine having cylinder diameter of 100 mm and stroke 120 mm was tested at 1600 rpm and the following readings were obtained :
 Fuel consumption = 0.27 litres/min
 Specific gravity of fuel = 0.74
 B.P. = 31.4 kW, Mechanical efficiency = 80%,
 Calorific value = 44000 kJ/kg.
 Determine :
 (i) bsfc (ii) imep (iii) Brake thermal efficiency. 5

8. (a) Discuss the effect of intercooling in multi-stage compression.

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(b) A two-stage air compressor is to be designed to compress $6 \text{ m}^3/\text{min}$ of free air (at ambient conditions) at 100 kPa 27°C to 900 kPa . The cylinders of the compressor are to be water jacketed and inter-cooler provided in between the two stages. The given data is

(i) $n = 1.3$

(ii) Volumetric efficiency of each cylinder = 80%

(iii) Temperature of air leaving intercooler = 37°C

(iv) Overall compressor efficiency = 85%

Determine the Piston displacement volume for each of the compressors.

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9. (a) What are the factors on which the complete combustion of fuel in a combustor depends ?

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(b) Classify the gas turbines and mention the principles on which they work.

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10. Write short notes on the following :

$$4 \times 2 \frac{1}{2} = 10$$

- (a) Dual Combustion Cycle
 - (b) Octane Number
 - (c) Merits of Liquid Fuels
 - (d) Ignition Advance
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