

**DIPLOMA IN MECHANICAL  
ENGINEERING (DME)  
Term-End Examination  
June, 2019**

**BME-053 : APPLIED THERMAL ENGINEERING**

*Time : 2 Hours*

*Maximum Marks : 70*

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*Note : Answer any five questions. Use of scientific calculator is permitted. Assume missing data suitably. Standard symbols and notations have usual meaning.*

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1. (a) Derive an expression for the thermal efficiency of an Otto cycle. 7
- (b) For an ideal otto engine working on air, the temperature at the end of isentropic compression is  $500\text{ }^{\circ}\text{C}$  and at the end of expansion is  $1400\text{ }^{\circ}\text{C}$ . If the compression ratio is to be 7.5, find the work done in a cycle and the efficiency. 7
2. (a) Discuss the importance of octane and cetane number of fuel. What is knocking ? 5

- (b) What are the gases coming out from I. C. engines that cause air pollution ? What measures can be adopted to reduce the pollution ? 9
3. (a) What are fuels ? How are they classified ? List examples of various types of fuels. Enumerate the characteristics of a good fuel. 7
- (b) Write the characteristics of the following gaseous fuels : 7
- (i) Coal gas
- (ii) Producer gas
4. Explain the following :
- (i) Cooling system in an I. C. engine with a neat sketch. 7
- (ii) Lubrication system in an I. C. engine with a neat sketch. 7
5. (a) State the uses of compressed air. Explain the classification of air compressor. What are the advantages of multistage compression ? 7
- (b) Derive the expression for the volumetric efficiency of a reciprocating compressor in terms of clearance ratio, pressure ratio and index of compression. 7

[3]

6. Air enters the compressor of a gas turbine plant operating on Brayton cycle at 101.325 kPa, 20°C. The pressure ratio in the cycle is 6. Calculate the maximum temperature in the cycle and the cycle efficiency. Assume  $W_T = 2.5 W_C$ , where  $W_T$  and  $W_C$  are the turbine and compressor work respectively. Take  $\gamma = 1.4$ . 14
7. Write short notes on any *two* of the following :

7 each

- (a) Reheating in gas turbine
- (b) Dual cycle
- (c) Intercooling with two-stage compression