

**DIPLOMA IN MECHANICAL ENGINEERING  
(DME) / ADVANCED LEVEL CERTIFICATE  
COURSE IN MECHANICAL ENGINEERING  
(DMEVI / ACMEVI)**

00242

**Term-End Examination**

**December, 2017**

**BME-052 : BASICS OF THERMAL ENGINEERING**

*Time : 2 hours*

*Maximum Marks : 70*

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*Note : Answer any **seven** questions. Each question carries equal marks. Use of scientific calculator is permitted. Use of Steam tables and Mollier diagram is permitted. Assume missing data, if any.*

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1. (a) Define the following :
- (i) Control volume
  - (ii) Work
  - (iii) Heat
- (b) Describe the following :
- (i) Quasi-static process and work done during this process
  - (ii) Temperature and Zeroth law of thermodynamics
- 10

2. A mass of gas is compressed in a quasi-static process from 80 kPa,  $0.1 \text{ m}^3$  to 0.4 MPa,  $0.03 \text{ m}^3$ . Assuming that the pressure and volume are related by  $pV^n = \text{constant}$ , find the work done by the gas. 10
3. A mixture of gases expands at constant pressure from 10 bar,  $0.03 \text{ m}^3$  to  $0.06 \text{ m}^3$  with 84 kJ positive heat transfer. There is no work other than that done on piston.
- (i) Find  $\Delta E$  for the gaseous mixture. The same mixture expands through the same path while a stirring device does 21 kJ work on the system.
- (ii) Find  $\Delta E$ ,  $W$  and  $Q$  for the process. 10
4. A heat engine of 30% thermal efficiency drives a Carnot refrigerator having a COP of 5. Calculate the heat input to the engine for 1 MJ of heat removed from the cold body by the refrigerator. 10
5. A sample of steam from a boiler drum at 3 MPa is put through a throttling calorimeter in which the pressure and temperature are found to be 0.1 MPa and  $120^\circ\text{C}$ . Find the quality of steam in the boiler drum. 10

6. Describe the working of the Babcock and Wilcox boiler with the help of a neat sketch. 10
7. Describe the bleeding of steam in turbines and its effect on efficiency. What do you mean by co-generation ? 10
8. What is the difference between natural draught and mechanical draught cooling towers ? Describe the working of a forced draught cooling tower with the help of a neat sketch. 10
9. Write short notes on the following : 10
- (a) Geothermal Energy
  - (b) Tidal Energy
10. Explain the phenomenon of heat transfer by convection. State Newton's law of cooling with a neat sketch. 10
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