

**DIPLOMA – VIEP- MECHANICAL
ENGINEERING (DMEVI)**

00421

Term-End Examination

December, 2014

BIME-023 : ENGINEERING THERMODYNAMICS

Time : 2 hours

Maximum Marks : 70

Note : Question no. 1 is **compulsory**. Out of the remaining seven questions from questions no. 2 to 8, attempt any **four** questions.

1. State whether the following statements are *true* or *false* : 7×2=14
- (a) Energy can flow in and out of a closed system, but mass cannot.
 - (b) Mixture of ice and water is a heterogeneous system.
 - (c) Amount of work done is a point function.
 - (d) The cyclic integral of a thermodynamic property is always zero.
 - (e) It is not possible to construct a PMM1.
 - (f) The COP of a refrigerator is given by

$$(\text{COP})_{\text{refr}} = \frac{1}{\frac{Q_1}{Q_2} - 1}$$
 - (g) All natural processes occur in a direction which causes an increase in entropy of the system.

2. (a) What is a thermodynamic cycle ? What do you understand by homogeneous and heterogeneous systems ? Give examples. What are intensive and extensive properties ? 7
- (b) A pump discharges a liquid into a drum at the rate of $0.032 \text{ m}^3/\text{s}$. The drum, 1.50 m in diameter and 4.20 m in length, can hold 3000 kg of the liquid. Find the density of the liquid and the mass flow rate of the liquid handled by the pump. 7
3. (a) Define internal energy. What is the difference between heat energy and internal energy ? How is energy stored in molecules and atoms ? 7
- (b) Give the Clausius' statement of the second law. What is a PMM2 ? Why is it impossible ? Explain. 7
4. (a) What is entropy ? What is the principle of Increase of Entropy ? Explain. 7
- (b) A cyclic heat engine operates between a source temperature of 800°C and a sink temperature of 30°C . What is the least rate of heat rejection per kW net output of the engine ? 7
5. (a) Calculate the work done in a reversible isothermal process of an ideal gas of mass 'm' from state 1 to state 2. 7
- (b) Derive any relation for the entropy change of an ideal gas when the state changes from 1 to 2. 7

6. (a) What is quality of steam ? Describe the different methods of measurement of quality. 7
- (b) Find the saturation temperature, the changes in specific volume and entropy during evaporation, and the latent heat of vaporization of steam at 1 MPa. 7
7. (a) What is meant by quality of energy ? What do you understand by exergy and energy ? Why is exergy of a fluid at a higher temperature more than that of a fluid at a lower temperature ? 7
- (b) Define calorific value of fuel. Differentiate between higher and lower calorific values of fuel. 7

8. Write short notes on any *four* of the following :

$$4 \times 3 \frac{1}{2} = 14$$

- (a) Point function
- (b) Quasi-static process
- (c) Specific heat at constant pressure (C_p)
- (d) Irreversibility
- (e) Availability
- (f) Heat engine