00694

DIPLOMA VIEP MECHANICAL ENGINEERING (DMEVI)

Term-End Examination

June, 2014

BIME-023 : ENGINEERING THERMODYNAMICS

Time : 2 hours *Maximum Marks : 70*

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

State whether the following statements are **true** or **false** :

1. (a) Neither energy nor mass can flow across the boundary of a closed system. **2x7**

(b) A homogeneous system consists of only one phase.

(c) A pure substance is also a homogeneous one.

(d) The cyclic integral of a thermodynamic property is always zero.

(e) In an isothermal process no heat transfer takes place across the system boundary.

(f) A PMM1 can be constructed successfully.

(g) An adiabatic, reversible process must be an isentropic process, also.

2. (a) What is a thermodynamic system ? Differentiate a closed system from an open system. What is an isolated system ? Explain with neat sketches. 7x2

(b) A pump discharges a liquid into a drum at the rate of 0.032 m^3/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.

3. (a) Define the specific heats at constant volume and constant pressure. Which property of a system increases when heat is transferred : 7x2

(i) at constant volume,

(ii) at constant pressure ?

(b) What is a cyclic heat engine ? Define the thermal efficiency of a heat engine cycle. Can it be 100% ? Explain.

4. (a) What is a Carnot cycle ? What are the four processes which constitute the cycle ? Explain. 7x2

(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 ?

5. (a) Calculate the work done in a reversible isothermal process of an ideal gas of mass 'm' from state 1 to state 2. 7x2

(b) Prove that for any ideal gas $C_p - C_v = R$, where R is the characteristic gas constant.

6. (a) What is a pure substance ? What do you understand by triple point ? Give the pressure and temperature of water at its triple point. **7x2**

(b) What is quality of steam ? What are the different methods of measurement of quality of steam ? Describe.

7. (a) What is available and unavailable energy ? What is high grade and low grade energy ? Explain with examples. **7x2**

(b) Define the terms weak mixture, rich mixture and stochiometric mixture. What is meant by dry and wet analysis of the products of combustion ?

8. Write short notes on **any four** of the following : **4x3.5**

(a) Ideal gas

(b) Heat pump

(c) Entropy

(d) Sensible heat

(e) Dryness fraction

(f) Polytropic process