

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

Term-End Examination

June, 2015

00256

BIME-023 : ENGINEERING THERMODYNAMICS

Time : 2 hours

Maximum Marks : 70

Note : Attempt any five questions. All questions carry equal marks. Use of Steam table and Mollier chart is allowed. Use of scientific calculator is permitted.

1. (a) What is a thermodynamic system ? Define an isolated system. Distinguish between the terms 'change of state', 'path' and 'process'.
- (b) Classify the following properties as either intensive or extensive :
- (i) Volume
 - (ii) Weight
 - (iii) Pressure
 - (iv) Temperature
 - (v) Density
 - (vi) Velocity
 - (vii) Kinetic energy

7+7

2. (a) What is the Zeroth law of thermodynamics ? Explain.
- (b) A reversible heat engine is operating between -13°C and 37°C . Find the COP as (i) heat pump, and (ii) refrigerator. 7+7
3. (a) In a steam power plant, the work output of the turbine is 100 kJ while heat supplied at the boiler is 300 kJ. Given that during the same period work input to the pump is 0.5 kJ, find the heat rejected at the condenser and thermal efficiency of the plant.
- (b) A heat engine operates between 527°C and 27°C . Find its efficiency, if (i) the engine is reversible and (ii) the engine is irreversible. 7+7
4. (a) A vacuum gauge mounted on a condenser reads 0.66 m Hg. What is the absolute pressure in the condenser in kPa when the atmospheric pressure is 101.3 kPa ?
- (b) Define the following :
- (i) Specific heat at constant volume
 - (ii) Specific heat at constant pressure
 - (iii) Sensible heat
 - (iv) Latent heat
 - (v) Internal energy
 - (vi) Enthalpy
 - (vii) CNG
- 7+7

5. (a) State the first law of thermodynamics for a closed system undergoing a cycle and a process.

(b) The following data refers to a 12-cylinder single-acting, two-stroke marine diesel engine :

Speed : 150 rpm

Cylinder diameter : 0.8 m

Stroke of piston : 1.2 m

Area of indicator diagram : $5.5 \times 10^{-4} \text{ m}^2$

Length of diagram = 0.06 m

Spring value : 147 MPa per m

Find the net rate of work transfer from the gas to the piston, in kW.

7+7

6. (a) In a cyclic process, heat transfers are +14.7 J, -25.2 kJ, -3.56 kJ, and +31.5 kJ. What is the net work for this cyclic process ?

(b) If a gas of volume 6000 cm^3 and at pressure of 100 kPa is compressed quasi-statically according to $pV^2 = \text{constant}$ unit, the volume becomes 2000 cm^3 . Determine the final pressure and the work transfer.

7+7

7. (a) Explain the Kelvin-Planck statement of the Second law of thermodynamics.

(b) Describe the types of fuels. What are the advantages of liquid fuels and gaseous fuels ?

7+7

8. (a) What is available energy and unavailable energy ? What is meant by quality of energy ?

(b) What are the four basic components of a steam power plant ? Draw the block diagram of a steam power plant.

7+7

