PVP 14

Code: ME3T2

II B.Tech - I Semester – Regular/Supplementary Examinations
November 2019

BASIC THERMODYNAMICS
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

DATA BOOKS ARE ALLOWED

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1.

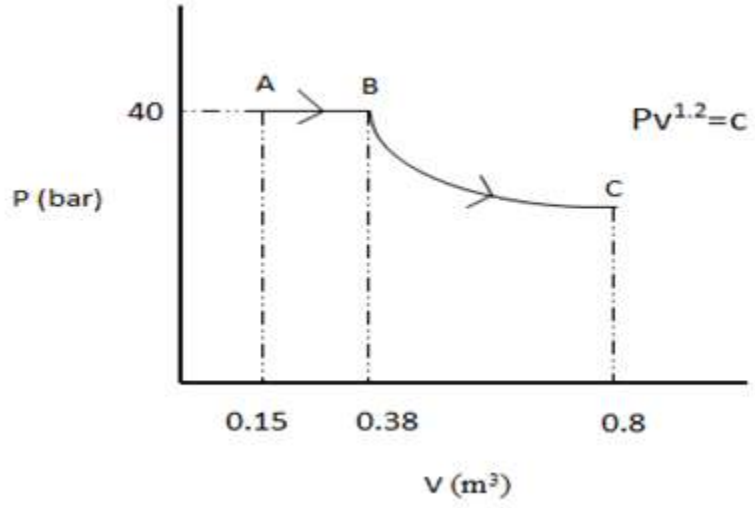
a) Distinguish between microscopic and macroscopic approach of thermodynamics.
b) Define state, change of state, process and types of process.
c) Explain about heat and work.
d) Define PMM 1.
e) What are the limitations of first law of thermodynamics?
f) Discuss why PMM-II cannot be constructed in practice.
g) Why Carnot cycle is ideal cycle?
h) Write Gibbs and Helmholtz function.
i) Discuss degree of superheat and degree of sub cooling.
j) What are the assumptions made in the analysis of an air standard cycle?
k) Define mean effective pressure and thermal efficiency of an air standard cycle.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks. 3 x 16 = 48 M

2. a) Derive an expression for work done for adiabatic process. 8 M

b) Determine the total work done by a gas system of an expansion process as shown in figure. 8 M



3. a) Explain Joule's experiment in detail. 8 M

b) Apply steady flow energy equation to a nozzle, turbine, compressor, and a boiler. 8 M

4. a) Derive thermal efficiency for Carnot cycle. 8 M

b) One kg of water at 273K is brought into contact with a heat reservoir at 373 K. When the water has reached 373 K, find the entropy change of water, the heat reservoir, and the universe. If water is heated from 273K to 373K by first bringing it in contact with a reservoir at 323 K and then with a reservoir at 373K, what will be the entropy change of universe? 8 M

5. a) Explain the Throttling and Free expansion process in detail. 8 M

b) A steam holding capacity of 4 m^3 contains a mixture of saturated water and saturated steam at 250^0C.
The mass of the liquid present is 1 ton. Determine:
(i)Quality; (ii) Specific Volume;
(iii) Specific Enthalpy; (iv) Specific Entropy and
(v) Specific Internal Energy of steam. 8 M

6. a) Show that the efficiency of a diesel cycle is a function of compression ratio and cut off ratio. 8 M

b) An air standard Diesel cycle operates with a compression ratio is 14.8 and a cutoff ratio 2. At the beginning of the compression the air pressure and the temperature are 37.8^0C and 1 bar respectively. Calculate the maximum temperature in the cycle and the heat input per cycle. 8 M