

7. (a) Explain reduced coordinates and compressibility factor. **8**  
(b) Determine constants of van der Waals equation of state. **12**
8. (a) Write Maxwell relations. **6**  
(b) Show that internal energy and enthalpy of an ideal gas are functions of temperature only. **14**

No. of Printed Pages : 04

Roll No. ....

**W-131**

**B. Tech. EXAMINATION, Dec. 2017**

(First Semester)

(Re-appear Only)

(W)

ME-(W)-101

THERMODYNAMICS

(Common for All Branch)

*Time : 3 Hours*

*[Maximum Marks : 100*

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Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

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**Note :** Attempt any *Five* questions. All questions carry equal marks.

M-W-131

4

20

(3-59/1) M-W-131

P.T.O.

1. (a) Show heat and work are path function not point function. State difference between heat and work. **14**  
 (b) Example of closed and open systems. **3**  
 (c) Explain Zeroth Law of Thermodynamics. **3**
  
2. A completely evacuated tank fully insulated is filled with 10 kg of air through a charging line maintained at pressure of 1000 kPa (10 bar) and enthalpy of 400 kJ/kg with negligible velocity. Final equilibrium state in the vessel is 1000 kPa, enthalpy of 600 kJ/kg and specific volume of 0.17 m<sup>3</sup>. The air in the vessel is heated by heating element. Determine the heat transfer by heating element. **20**
  
3. Three identical finite bodies A, B and C of constant heat capacity are at temperatures 400, 200 and 400 K respectively. A heat engine is operated between A and B and a heat pump working as refrigerator is operated between B

and C. The heat pump is operated by the output of heat engine. If no work or heat supplied from outside, find the highest temperature to which any *one* of the bodies can be raised by the operation of heat engine or refrigerator. **20**

4. (a) Explain equivalence of Kelvin and Clausius statement. **10**  
 (b) Explain principle of Entropy increase. **5**  
 (c) State Third law of thermodynamics. **5**
  
5. Explain the following :  
 (a) High and low grade energy. **8**  
 (b) Availability and irreversibility **8**  
 (c) Helmholtz and Gibbs Function. **4**
  
6. (a) Explain solid-liquid vapor equilibrium for pure substance. **6**  
 (b) Explain dry, wet and superheated steam. **6**  
 (c) Explain any *one* method of determining dryness fraction of steam. **8**