

**II B.Tech I Semester (R07) Supplementary May 2012 Examinations**  
**THERMODYNAMICS**  
**(Mechanical Engineering)**

Time: 3 hours

Max. Marks: 80

**Answer any FIVE questions**  
**All questions carry equal marks**

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1. (a) What is a quasi-static process? What is its characteristic feature?  
(b) The properties of a closed system change following the relation between pressure and volume as  $P V = 3.0$  where  $P$  is in bar,  $V$  is in  $m^3$ ? Calculate the work done when the pressure increases from 1.5 bar to 7.5 bar.
2. (a) Explain with a neat sketch the working of a constant volume gas thermometer.  
(b) 90 kJ of heat is supplied to a system at a constant volume. The system rejects 95 kJ of heat at constant pressure and 18 kJ of work is done on it. The system is brought to original state by adiabatic process. Determine (i) adiabatic work (ii) the values of internal energy at all end states if initial value is 105 kJ.
3. (a) Enunciate the two classical statements Kelvin-Planck and Gaussius of second law of thermodynamics.  
(b) A Carnot engine operates between 1000 K and 300 K. The change in entropy of the sources is 0.6 kJ/k. Find the heat added and net work output.
4. Discuss the various methods of evaluating the properties of a pure substance when it is in (a) Superheated state (b) Wet condition (c) Sub cooled condition.
5. (a) What is meant by triple point of a substance?  
(b) 1 kg of  $CO_2$  has a volume of  $0.003 m^3$  and a pressure of 100 atm. Complete the temperature by (i) Perfect gas equation (ii) Vander Waal's equation.
6. (a) Derive the expression for specific humidity in terms of partial pressure of water vapour.  
(b) Define (i) Avogadro's laws of additive volumes (ii) Dalton's law of partial pressures.
7. (a) Derive an expression for mean effective pressure of a diesel cycle.  
(b) The compression ratio in a diesel cycle is 14 and the cut off occurs at 10 % of the stroke. Determine the cut-off ratio and thermal efficiency of the cycle.
8. (a) Explain with a neat sketch the working of Bell Coleman cycle.  
(b) What are the advantages and disadvantages of air-refrigeration system?

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