Exam. No: _____

GANPAT UNIVERSITY
B.TECH SEM. III[RD] MECHANICAL ENGINEERING
REGULAR EXAMINATION NOV/DEC. - 2011
2ME-305: ENGINEERING THERMODYNAMICS

TIME: - 3 HOURS **TOTAL MARKS-70**

INSTRUCTIONS: (1) All questions are compulsory.
(2) Assume suitable data if necessary.
(3) Figure to the right indicates full marks.
(4) Scientific calculator, steam table is allowed.

SECTION - I

Que.-1 **a** What do you meant by thermodynamic system? Explain all system with examples. **06**

b Derive the workdone equation of adiabatic process with diagram. **06**

OR

Que.-1 **a** Explain the following process with examples: **06**
(i) Reversible process
(ii) Quasi-static process
(iii) Irreversible process

b 0.2 m^3 of air at 4 bar and 130°C is contained in a system. A reversible adiabatic expansion take place till the pressure falls to 1.02 bar. The gas is then heated at constant pressure till enthalpy increase by 72.5 kJ. Calculate (i) The work done (ii) The index of expansion, if the above processes are replaced by a single reversible polytropic process giving the same work between the same initial and final states. Take Cp = 1 kJ/kg K, Cv = 0.714 kJ/kg K. **06**

Que.-2 **a** Explain the equivalence of Clausius statement to Kelvin-Planck statement. **06**

b Explain the Clausius inequality. **05**

OR

Que.-2 **a** Explain the principle of entropy generation in closed system. **06**

b 0.04 kg of carbon dioxide (molecular weight = 44) is compressed from 1 bar, 20°C, until the pressure is 9 bar, and the volume is then 0.003 m^3. Calculate the change of entropy. Take c_p for carbon dioxide as 0.88 kJ/kg K, and assume carbon dioxide to be perfect gas. **05**

Que.-3 **Attempt Any Three Questions.** **12**

a Explain types of thermal equilibrium.

b Prove that internal energy is the property of system.

c Write limitations of first law of thermodynamic.

d Explain the concept of quality of energy.

SECTION - II

Que.-4	a	Explain the Otto cycle and derive air standard efficiency equation for Otto cycle.	06
	b	An amount of perfect gas has initial condition of volume 1 m^3, pressure 1 bar and temperature 18°C. It under goes ideal diesel cycle operation, the pressure after isentropic compression being 50 bar and volume after constant pressure expansion being 0.1 m^3. Calculate the temperature of measure points of cycle and evaluate the thermal efficiency of the cycle. Assume $\gamma = 1.4$ for the gas	06

OR

Que.-4	a	Compare the Otto, Diesel and Dual cycle (i) For constant maximum pressure and same heat input. (ii) For same maximum pressure and temperature.	06
	b	Derive the air standard efficiency for Brayton cycle and compare it with Diesel cycle.	06
Que.-5	a	Explain the Rankine cycle and derive the equation for thermal efficiency.	06
	b	Describe Binary vapour cycle with neat sketch.	05

OR

Que.-5	a	What is Carnot cycle? Explain it in detail and derive the equation for thermal efficiency.	06
	b	Explain T-S diagram for pure substance.	05
Que.-6		**Attempt Any Three Questions.**	12
	a	Derive the equation for Combined Gas Law.	
	b	Explain dead state concept.	
	c	Describe Dalton's Law of partial pressure.	
	d	Explain following terms: (i) Pure substance (ii) Phase (iii) Triple point (v) Dryness fraction	

END OF PAPER