COURSE – THERMODYNAMICS AND STATISTICAL MECHANICS

PRACTICE SET – 4 (LAWS OF THERMODYNAMICS) **Date: 08-06-2017**

MCQ

1 The internal energy of a certain system is a function of temperature alone and is given by the formula E = 25 + 0.25t kJ. If this system executes a process for which the work done by it per degree temperature increase is 0.75 kJ/K, then the heat interaction per degree temperature increase, in kJ, is

(a) –1.00 (b) –0.50 (c) 0.50 (d) 1.00

2 When a gas is heated at constant pressure, the percentage of the energy supplied, which goes as the internal energy of the gas is

(a) More for a diatomic gas than for triatomic gas

(b) Same for monatomic, diatomic and triatomic gases but less than 100%

(c) 100% for all gases

(d) Less for triatomic gas than for a diatomic gas

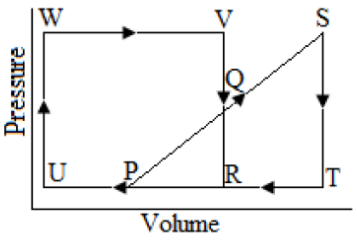
3 During a process with heat and work interactions, the internal energy of a system increases by 30 kJ. The amounts of heat and work interactions are respectively

(a) - 50 kJ and - 80 kJ (b) -50 kJ and 80 kJ (c) 50 kJ and 80 kJ (d) 50 kJ and - 80 kJ

4 A system executes a cycle during which there are four heat transfers: Q_{12} = 220 kJ, $Q_{23} = -25$kJ, $Q_{34} = -180$ kJ, Q_{41} = 50 kJ. The work during three of the processes is W_{12} = 15kJ, $W_{23} = -10$ kJ, W_{34} = 60kJ. The work during the process $4-1$ is

(a) - 230 kJ (b) 0 kJ (c) 230 kJ (d) 130 kJ

5 Two ideal heat engine cycles are represented in the given figure. Assume VQ = QR, PQ = QS and UP =PR =RT. If the work interaction for the rectangular cycle (WVUR) is 48 Nm, then the work interaction for the other cycle PST is:



(a) 12Nm (b) 18 Nm (c) 24 Nm (d) 36 Nm

6 In an adiabatic process, 5000J of work is performed on a system. The system returns to its original state while 1000J of heat is added. The work done during the non-adiabatic process is:

(a) + 4000J (b) - 4000J (c) + 6000J (d) - 6000J

7 In a thermodynamic cycle consisting of four processes, the heat and work are as follows:

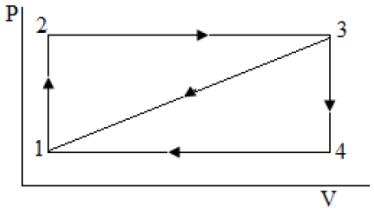
Q: $+30, -10, -20, +5$

W: $+3, 10, -8, 0$

The thermal efficiency of the cycle will be:

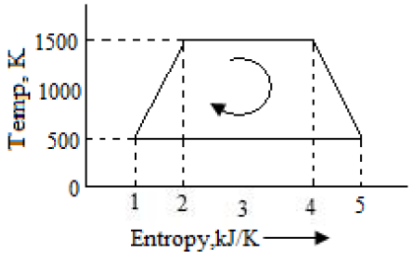
(a) Zero (b) 7.15% (c) 14.33% (d) 28.6%

8 Given that the path 1-2-3, a system absorbs 100kJ as heat and does 60kJ work while along the path 1- 4-3 it does 20kJ work (see figure given). The heat absorbed during the cycle 1-4-3 is:



(a) - 140 kJ (b) - 80 kJ (c) - 40kJ (d) + 60 kJ

9 The efficiency of a reversible cyclic process undergone by a substance as shown in the given diagram is:



(a) 0.40 (b) 0.55 (c) 0.60 (d) 0.80

10 The heat transferred in a thermodynamic cycle of a system consisting of four processes is successively 0, 8, 6 and -4 units. The net change in the internal energy of the system will be

(a) – 8 (b) Zero (c) 10 (d) –10

Question	Answer	Question	Answer
1	d	6	c
2	a	7	c
3	a	8	d
4	b	9	c
5	c	10	b