

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester : II (New)	Term : II	Academic Year : 2013-14
Course No. : APE 121	Title : Thermodynamics	
Credits : 3 (2+1)		
Day & Date : Tuesday, 29.04.2014	Time : 09.00 to 12:00	Total Marks : 80

- Note :**
1. Solve ANY EIGHT questions from SECTION "A".
 2. All questions from SECTION "B" are compulsory.
 3. All questions carry equal marks.
 4. Draw neat diagrams wherever necessary.

SECTION "A"

- Q.1** a) Derive an expression for change of entropy of a perfect gas in terms of volume and absolute temperature.
- b) Cold air from atmosphere is circulated through an air heating system, where the temperature of air is increased from 7.2°C to 21.2°C without any pressure loss. If the hourly consumption of warm air at 21.2°C is 850 m^3 , calculate how much heat per hour must be imparted to the air? What will be the change in entropy of air circulated per hour? Assume proper values of the specific heat of air.
- Q.2** a) 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3 . Calculate the final pressure of the gas and heat supplied during the process.
- b) State the general laws for expansion and compression.
- Q.3** Write short notes on (Any Two)
- 1) Approximate method of heat absorbed
 - 2) Temperature versus total heat graph
 - 3) Thermodynamic process of vapour
- Q.4** Find the internal energy of 1 kg of super heated steam at a pressure of 10 bar and 280°C . If this steam be expanded to a pressure of 1.6 bar and 0.8 dryness fraction, determine the change in internal energy. Assume specific heat of superheated steam as 2.1 kJ/kgK .
- Q.5** a) What are the essentials of a good steam boiler?
- b) Explain the working principle of Cochran Boiler.
- Q.6** a) Give the classification of Thermodynamic systems. Explain any one system.
- b) Give the classification of properties of a system. Explain any one.
- Q.7** a) A mass of 0.25 kg of air in a closed system expands from 2 bar, 60°C to 1 bar and 40°C while receiving 1.005 kJ of heat from a reservoir at 100°C . The surrounding atmosphere is at 0.95 bar and 27°C . Determine the maximum work. How much of this work would be done on the atmosphere?
- b) Derive an equation for heat supplied in as Isochoric process.

(P.T.O.)

- Q.8 a) A 0.568 m^3 capacity insulated vessel of oxygen at a pressure of 2 bar is stirred by an internal paddle until the pressure becomes 2.4 bar.
Find out (i) Heat transferred, (ii) Work output and (iii) Change in entropy per kg.
(Take $C_v = 0.657 \text{ kJ/kg K}$ and $R = 260 \text{ J/kg.K}$).
- b) Give the advantages of superheated steam
- Q.9 a) Enlist the types of stored energy. Explain any two.
- b) A spherical vessel of 1.5 m diameter containing air at 40°C is evacuated till the vacuum inside the vessel becomes 735 mm of Hg. Calculate the mass of air pumped out. If the tank is then cooled to 3°C , what will be the final pressure in the tank?
(Take atmospheric pressure as 760 mm Hg.)
- Q.10 Enlist various mountings and accessories of a boiler and explain any two.

SECTION "B"

- Q.11 Define the following terms.
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|---------------------------------|----------------------------|
| 1) Second | 2) Stored Energy |
| 3) Zeroth Law of Thermodynamics | 4) Kelvin-Planck Statement |
| 5) Unavailable heat energy | 6) Sensible heat of water |
| 7) Dry saturated steam | 8) Dryness fraction |
- Q.12 Fill in the blanks.
- 1) An irreversible process always results in _____.
 - 2) When the steam contains moisture or particles of water in suspension, it is said to be _____.
 - 3) When the dry steam is further heated at a constant pressure, then raising its temperature, it is said to be _____.
 - 4) _____ is that part of heat energy which can be converted into mechanical work by ideal process which reduces the system in a state of equilibrium.
 - 5) The processes occurring in open systems which permit the transfer of mass to and from the system are known as _____.
 - 6) A gas occupies a volume of 0.1 m^3 at a temperature of 20°C and a pressure of 1.5 bar. The final temperature of the gas, if it is compressed to a pressure of 7.5 bar and occupies a volume of 0.04 m^3 is _____.
 - 7) _____ a definite area or a space where some thermodynamic process is taking place.
 - 8) The field of science, which deals with the energies possessed by gases and vapours, is known as _____.

