8. Write short notes on the following :

(i) Use of second law of thermodynamics in daily life

(ii) Exergy analysis of simple thermodynamic processes.

Roll No. .....

Subject Code—6029

M. Tech. EXAMINATION

(Main/Reappear Batch 2011 Onwards)

(Third Semester)

MECHANICAL ENGINEERING

MELP-737

Advanced Thermodynamics

Time : 3 *Hours* *Maximum Marks :* 70

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

1. How does the subject of thermodynamics differ from concept of heat transfer ? The pressure in (in N/m^2 absolute) and volume (in m^3/kg) of the atmosphere are related as $pv^{1.4} = 2.3 \times 10^3$. The acceleration due to gravity is constant at 9.81 m/s^2. Determine the depth of atmosphere necessary to produce a pressure of 1.0132 bar at the earth's surface when the atmosphere is considered as a fluid column.

2. What do you understand by path function and point function ? What are the exact and inexact differentials ? 680 kg. of fish at 5°C are to be frozen and stored at –12°C. The specific heat of fish above freezing point is 3.182, and below freezing point is 1.717 kJ/kgK. The freezing point is –2°C, and the latent heat of fusion is 234.5 kJ/kg. How much heat must be removed to cool the fish, and what percent of this is latent heat ?

3. Show that the enthalpy of a fluid before throttling is equal to that after throttling. A reciprocating air compressor takes in 2 m^3/min. at 0.11 MPa, 20°C which it delivers at 1.5 MPa, 111°C to an after-cooler where the air is cooled at constant pressure to 25°C. The power absorbed by the compressor is 4.15 kW. Determine the heat transfer in (i) the compressor, and (ii) the cooler. State your assumptions clearly.

4. All spontaneous processes are irreversible. Explain. A domestic refrigerator maintains the space at 2°C, while the condensing temperature is 37°C. It extracts 500 W of heat from the cold space and the compressor consumes 100 W of electric power. Estimate the internal entropy generation rate, ignoring any external irreversibility. What would have been the power consumption had the cycle been internally reversible ?

5. Define volumen expansitivity and isothermal compressibility. Find the change of entropy of a gas following Clausius equation of state at constant temperature p(v-b)=RT.

6. Explain the relationship between the intensive properties.

7. How are the maximum temperature and maximum pressure in the Rankine cycle fixed. Give a comparison between Otto, Dual and Diesel air standard power cycles.