

Mid term Exam

M.E. (Food Technology) 1<sup>st</sup> Semester

Food Engineering

Time Allowed: 1 hour

Maximum Marks: 25

1. Define the following terms: (2.5\*4=10)
- a) Nusselt Number
  - b) Shell and tube type heat exchanger
  - c) Cooling Load
  - d) Ohmic heating
2. Discuss the various components of vapor compression refrigeration system. (5)
3. Define Microwave heating. Explain the two mechanisms involved in microwave heating. (5)
4. Calculate the rate of heat transfer across a glass pane that consists of two 1.6-mm thick glass separated by 0.8-mm layer of air. The heat transfer coefficient on one side that is at 21°C is 2.84 W/(m<sup>2</sup> · K) and on the opposite side that is at -15°C is 11.4 W/(m<sup>2</sup> · K). The thermal conductivity of glass is 0.52 W/(m · K) and that of air is 0.031 W/(m · K). (5)

Or

5. A cold storage room is being maintained at 3°C using a vapor-compression refrigeration system that uses R-134a. The evaporator and condenser temperatures are 5 and 50°C, respectively. The refrigeration load is 25 tons. Calculate the mass flow rate of refrigerant, the heat rejected by refrigerant in condenser, and the C.O.P. Assume the unit operates under saturated conditions and the compressor efficiency is 80%. ( $H_1 = 156$  kJ/kg;  $H_2 = 296$  kJ/kg;  $H_3 = 327$  kJ/kg) (5)