Chemical Engineering Principles – I (ChE201)
Time: 90 minutes   **First Examination**   **Date: 22/11/1430 H**

Instructions:
  1-   Answer **ALL** questions
  2-   **Data**: Atomic mass: **H=1, C=12, O=16, N=14**

Question 1 (5 points):
        Convert the followings if possible:
        (i)   27 ft/min^2 ➔   m/s^2
        (ii)   77 Btu/(lbmole. R^o) ➔   cal/(mol.K^o)
        (iii)   32 g   ➔   gmole
        (iv)   420 ^{o}R ➔ ^{o}C
        (v)   200 K^o ➔ F^o

Question 2 (5 points):
        Consider the following equation: $C_p (Cal / mol.C^o) = 2.1 + 3.2T \ (^oC)$

        where **Cp** is heat capacity in (Cal/mol.C°) and **T** is the temperature in (°C)
        (i) What are the units of   2.1   and 3.2
        (ii) Convert the equation to read **Cp** in (BTU/mol.R°) and **T** (°F)

Question 3 (6 points):
        A gaseous mixture which contains: O_2=20% ; CO_2=40%, CO=15%, H_2=13%
and N_2=12% by moles flows at a molar flow rate of 200 Kmol/s.
(a)   Calculate the average molecular weight of this mixture.
(b)   Calculate the mass flow rate of this mixture in g/h.
(c)   Calculate the mass composition of the gas mixture.

Question 4 (4 points)
        Ethylbenzene at 20 °C follows at a rate of 75 ft^3/min
Calculate:
  (a)   The mass flow rate
  (b)   The molar flow rate (mol/s)