King Saud University

Department of Mathematics

First Mid Term Exam

ACTU 361 - Mathematics of Finance (1)

(20/1/1437 H, Time 1H30)

Question 1. [5]

Consider two investment: the first involves depositing \$1,000 in an account paying a compounded monthly interest rate of 5%, and the second involves depositing \$800 in an account paying annual effective rate of 6%. How long will it take for the two accounts to have the same balance?

Question 2.(Exam SOA)[6]

Kathyrn deposits 100 into an account at the beginning of each 4 years period for 40 years. The account credits interest at an annual effective interest rate of r.

The accumulated amount in the account at the end of 40 years is X, which is 5 times the accumulated amount in the account at the end of 20 years.

Calculate X.

Question 3. [7]

(a) Give the definition of a continuous annuity for n periods and show that the present value of such annuity is:

$$\bar{a}_n = \frac{1 - e^{-n\delta}}{\delta}$$

Where $\delta > 0$ is the corresponding force of interest.

(b) Deduce that:

$$\bar{a}_{\infty} = \frac{1}{\delta}$$

(c) Starting 4 years from today, a perpetuity will pay continuously $100 per year with an annual interest rate of 6%.Find the present value of this perpetuity.

Question 4. [7]

You receive the following payments: $200 at the end of the second year, $180 at the end of the third year and so on, until 10 years with an annual interest rate of 5%.

(a) Determine the present value of these payments at t=0.

(b) Determine the accumulated value of these payments at the time of the last payment.