**King Saud University**

**Department of Mathematics**

**First Mid Term Exam**

ACTU 361 - Mathematics of Finance (1)

(25/2/1437 H, Time 1H30)

**Question 1. [9]**

1. We consider an annuity-due with a term of n periods where the interest rate is i per period, and where the first payment is 1 at t=0.
2. We suppose that each subsequence payment is k% greater than the preceding payment. Prove that if , then the present value of such annuity is equal to:
3. We suppose that each subsequence payment is k% less than the preceding payment. Prove that in this case the present value of such annuity is equal to:
4. Matthew makes a series of payments at the beginning of each year for 20 years. The first payment is $100. Each subsequent payment through the 9 first years increase by 5 % from the previous payment. From the 10th payment, each payment decreases by 5% from the previous payment.

Calculate the present value of these payments at t=0 using an annual effective rate of 7%.

**Question 2. [8]**

A contractor needs to buy a new truck which price of $ 20,000,

by a loan that he will pay over 4 years with semiannual payments at an interest rate of 10% compounded semiannually.

Construct an amortization schedule for the contractor.

**Question 3. [8]**

A housing loan is to be repaid with a 15-year monthly annuity immediate of

$ 2,000 at an interest rate of 0,5 % per month.

1. Find the remaining balance after 20 payments.
2. After 20 payments, the borrower stopped paying the installment for 10 months. What is the new amount of the remaining balance after 10 months?
3. When he start repaying the loan new installment, he has to pay a penalty equal to 1.5 % of the remaining balance
4. Calculate the new remaining balance
5. Calculate the revised installment when the borrower start to pay back again so that the loan period remains unchanged.