

King Fahd University Of Petroleum & Minerals

Department Of Mathematics

AS201 : Financial Mathematics (231)

ID: _____

Name: _____

Question #	Full Mark	Marks Obtained
1	8	
2	8	
3	8	
4	8	
5	5	
6	8	
7	5	
8	10	
9	10	
10	10	
11	10	
12	10	
Total	100	

1. Ed buys a TV from Al for 480 by paying 50 in cash, 100 every three months for one year (four payments of 100), and a final payment in 15 months (three months after the final quarterly payment). Find the amount of the final payment if Al earns a 3-month compound interest rate of 3%. What is the final payment if Al earns a one-month rate of 1%?

2. Eric deposits X into a savings account at time 0, which pays interest at a nominal rate of i , compounded semiannually.

Mike deposits $2X$ into a different savings account at time 0, which pays simple interest at an annual rate of i .

Eric and Mike earn the same amount of interest during the last 6 months of the 8th year. Calculate i .

3. Jeff deposits 10 into a fund today and 20 fifteen years later. Interest is credited at a nominal discount rate of d compounded quarterly for the first 10 years, and at a nominal interest rate of 6% compounded semiannually thereafter. The accumulated balance in the fund at the end of 30 years is 100. Calculate d .

4. At time $t=0$, 1 is deposited into each of Fund X and Fund Y. Fund X accumulates at a force of interest $\delta_t = \frac{t^2}{k}$. Fund Y accumulates at a nominal rate of discount of 8% per annum convertible semiannually. At time $t=5$, the accumulated value of Fund X equals the accumulated value of Fund Y. Determine k .

5. Suppose that for the coming year inflation is forecast at an effective annual rate of $r=0.15$ and interest is forecast at effective annual rate $i=0.10$. What will be the corresponding real, or inflation- adjusted rate of interest for the coming year?

6. Assume \$100,000 can be invested under two options:

Option 1: Deposit the \$100,000 into a fund earning an annual effective rate of i .

Option 2 : Purchase an annuity-immediate with 36 level annual payments at an annual effective rate of 10%.

The payments under Option 2 are deposited into a fund earning an annual effective rate of 5%. Both options produce the same accumulated value at the end of 36 years. Calculate i .

7. Given $s_{10|7.1} = S$ find the value of $\sum_{k=1}^{10} s_{k|7.1}$ in term of S.

8. A perpetuity paying 1 at the beginning of each 6-month period has a present value of 20. A second perpetuity pays X at the beginning of every 2 years. Assuming the same effective annual interest rate, the two present values are equal. Determine X.

9. Kathryn deposits 10 into an account at the beginning of each 4-year period for 40 years. The account credits interest at an effective annual interest rate of i . 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 .

10. On the first day of every January, April, July and October Smith deposit 100 in an account earning $i^{(4)} = 0.16$. He continues the deposits until he accumulates a sufficient balance to begin withdrawals of 200 every 3 months, starting 3 months after the final deposit, such that he can make twice as many withdrawals as he made deposits. How many deposits are needed?

11. Olga buys a 5-year increasing annuity for X . Olga will receive 2 at the end of the first month, 4 at the end of the second month, and for each month thereafter the payment increases by 2. The nominal interest rate is 9% convertible quarterly. Calculate X .

12. Joe can purchase one of two annuities:

Annuity 1:

A 10-year decreasing annuity-immediate, with annual payments of 10, 9, 8, ..., 1.

Annuity 2:

A perpetuity-immediate with annual payments. The perpetuity pays 1 on year 1, 2 in year 2, 3 in year 3, ..., and 11 in year 11. After year 11, the payments remain constant at 11.

At an effective annual interest rate of i , the present value of Annuity 2 is twice the present value of Annuity 1. Calculate the value of Annuity 1.