Instructions.

1. Please turn off your cell phones and place them under your chair. Any student caught with mobile phones on during the exam will be considered under the cheating rules of the University.

2. If you need to leave the room, please do so quietly so not to disturb others taking the test. No two person can leave the room at the same time. No extra time will be provided for the time missed outside the exam room.

3. Only materials provided by the instructor can be present on the table during the exam.

4. Use the blank portions of each page for your work. Extra blank pages can be provided if necessary. If you use an extra page, indicate clearly what problem you are working on.

5. Only answers supported by work will be considered. Unsupported guesses will not be graded.

6. While every attempt is made to avoid defective questions, sometimes they do occur. In the rare event that you believe a question is defective, the instructor cannot give you any guidance beyond these instructions.

7. Mobile calculators, I-pads, or communicable devices are disallowed. Use regular scientific and/or financial calculator only. Write important steps to arrive at the solution of the following problems.

8. Do not spend too much time on any one question. If a question seems too difficult, leave it and go on.

The test is 150 minutes, GOOD LUCK, and you may begin now!

<table>
<thead>
<tr>
<th>Question</th>
<th>Total Marks</th>
<th>Marks Obtained</th>
<th>Comments</th>
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Extra blank page
1. (4+1=5 marks) Suppose the amount in a fund one and a half years from today is 100. Find the present value of the fund if the nominal rate of discount is 5% convertible quarterly.

   a) 86.8
   b) 96.4
   c) 92.2
   d) 92.7
   e) 92.9

   Work Shown (4 points)

2. (4+1=5 marks) Terry purchases an annuity with payments made at the beginning of each month for 36 payments. The monthly payments are a constant amount of 15 for the first 24 payments, however the 25th payment is 20, the 26th payment is 25, the 27th payment is 30 and this arithmetic sequence continues until the 36th payment. The nominal interest rate is 6% convertible monthly. What is the present value of this annuity?

   a) 871.6
   b) 829.1
   c) 827.5
   d) 823.1
   e) 764.0

   Work Shown (4 points)

   Answer is ______
3. (1+4=5 marks) Andy purchases a 16 year annuity immediate paying 100 the first year and increasing by 4% each year thereafter. Rick purchases a 16 year annuity immediate paying $X$ the first year and decreasing by 2% each year thereafter. At an effective annual rate of 5%, both annuities have the same present value. Calculate $X$.
   a) 148.7
   b) 145.2
   c) 124.5
   d) 123.2
   e) 120.0

   Work Shown (4 points)

   Answer is____

4. (4+1=5 marks) An annuity due pays an initial benefit of 1 per year, with the benefit increasing by 10.25% every four years. The annuity is payable for 40 annual payments. Using an annual effective rate of 2%, calculate the future value of this annuity.
   a) 42
   b) 59
   c) 69
   d) 83
   e) 93

   Work Shown (4 points)

   Answer is_____
5. (4+1=5 marks) An appliance store offers to sell a television for $5000. Suppose the current market loan rate is a nominal rate of 10% convertible monthly. As an inducement, the dealer offers 100% financing at a **nominal rate** of 6% convertible monthly. The loan is to be repaid in equal installments at the end of each month for a 3 year period.

If the dealer himself is paying monthly payments on the market loan, but finances his customer with the inducement loan, what is the final cost to the dealer, in terms of total paid, for the inducement?

   a) 175  
   b) 308  
   c) 311  
   d) 332  
   e) 420  

Work Shown (4 points)

   Answer is ______

6. (4+1=5 marks) Todd borrows X for nine years at an annual effective interest rate of 8%, to be paid with equal payments at the end of each year. The outstanding balance immediately after the fifth payment is 4506.74. Calculate the principal repaid in the first payment.

   a) 1361  
   b) 901  
   c) 681  
   d) 574  
   e) 384  

Work Shown (4 points)

   Answer is ______
7. (4+1=5 marks) Ken purchases a $200000 home. Mortgage payments are to be made monthly for 30 years with the first payment to be made one month from now. The annual effective rate of interest is 5%. Starting with the 100th payment, each monthly payment is increased by $400 in order to repay the mortgage more quickly.

Calculate the total amount of interest paid during the duration of the loan.

a) 136558   
b) 136216   
c) 136215   
d) 136159   
e) 135648

Work Shown (4 points)

8. (4+1=5 marks) An 8 year par value bond with semiannual coupons at 6% convertible semiannually has a price of 1050. The bond can be called at par value of X on any coupon date starting at the end of year 6. The price guarantees that Sue will receive a yield of at least 5% convertible semiannually. Calculate X.

a) 721   
b) 944   
c) 999   
d) 1050   
e) 1276

Work Shown (4 points)

Answer is _____
9. (4+1=5 marks) Katie purchases a 15 year par value bond with 5% semianual coupons at a price of 2345. The bond can be called at par value \( X \) on any coupon date starting at the end of year 10. The price guarantees that Katie will receive a nominal semianual yield of at least 4%. Mark purchases a 15 year par value bond identical to Katie’s except it is not callable. Assuming the same yield, what is the price of Mark’s bond?

a) 2168  
b) 2170  
c) 2300  
d) 2405  
e) 2411  

Work Shown (4 points)

Answer is ____

10. (4+1=5 marks) Paul pays $100 000 today for a 4-year investment that returns cash flows of $60 000 at the end of each years 3 and 4. Suppose at 15%, the net present value of Paul’s cash flows is equal to the net present value of Kelly’s cash flows, where Kelly makes an investment of \( X \) one year from today that returns cash flows of $60 000 at the end of each of years 4 and 5. Calculate \( X \).

a) 90379  
b) 94316  
c) 98503  
d) 103937  
e) 105380  

Work Shown (4 points)

Answer is ____

Answer is ____
11. (4+1=5 marks) A fund earned investment income of $8000 during 2004. The beginning and ending balances of the fund were $95,000 and $120,000 respectively. A deposit was made at time $K$ during the year. No other deposits or withdrawals were made. The fund earned 7.5235% in 2004 using the dollar-weighted method. Determine $K$.

a) Feb 1
b) Mar 1
c) May 1
d) July 1
e) October 1

Work Shown (4 points)

12. (1+4=5 marks) The following are the prices of $100 zero-coupon bonds redeemable at par.

<table>
<thead>
<tr>
<th>Term to Maturity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>96.23</td>
</tr>
<tr>
<td>2</td>
<td>94.12</td>
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<tr>
<td>3</td>
<td>89.23</td>
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<td>4</td>
<td>84.59</td>
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<tr>
<td>5</td>
<td>82.48</td>
</tr>
</tbody>
</table>

Determine the four year forward rate.

a) 2.55%
b) 5.20%
c) 5.49%
d) 12.10%
e) 13.76%

Work Shown (4 points)

Answer is _____

Answer is _____
13. (1+4=5 marks) Suppose that the following is a term structure of yields on zero coupon bonds.

<table>
<thead>
<tr>
<th>Term</th>
<th>Zero Coupon Bond Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 years</td>
<td>5%</td>
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<tr>
<td>2 years</td>
<td>7%</td>
</tr>
<tr>
<td>3 years</td>
<td>8%</td>
</tr>
<tr>
<td>4 years</td>
<td>9%</td>
</tr>
</tbody>
</table>

A four year 1000 face value bond with annual coupons has a price of 895. Calculate the annual coupon rate using the yields rates given in the term structure.

a) 7.3%
b) 7.0%
c) 6.0%
d) 5.6%
e) 5.0%

Work Shown (4 points)

Answer is ___

14. (1+4=5 marks) What is the modified duration of a five year 2000 par value bond with 8% annual coupons and an effective rate of interest equal to 7%?

a) 4.327
b) 4.044
c) 3.802
d) 3.550
e) 3.287

Work Shown (4 points)

Answer is ___
15. (Bonus 4+1=5 marks) SeventiesCo sells gold chains. Each chain sells at a price equal to the cost of gold used to make the chain plus $20. The fixed cost per chain is $10. Forward contracts and put and call options on gold are available. What should SeventiesCo do to control risk?

a) Enter into long forward contracts to purchase gold at the forward price.
b) Buy calls on gold to assure that gold can be obtained at a set price.
c) Create a straddle using purchased calls and puts at the same strike to combat volatility
d) Hedge with a zero-cost collar
e) None of these.

Work Shown (4 points)

Answer is____

16. (Bonus 4+1=5 marks) A stock has current price 50. It pays no dividends. The risk-free rate is \( r = 0.025 \). You observe an actual six month forward price of 50.68. Which of the following describes a possible arbitrage of the forward price?

a) You can arbitrage this price by selling the forward at 50.68, buying the stock at 50 and borrowing 50 for 6 months at the risk-free rate.
b) You can arbitrage this price by selling the forward at 50.68, buying the stock at 50 and borrowing 49.48 for six months at the risk-free rate
c) You can arbitrage this price by selling the stock forward at 50.68, selling the stock short at 50 and borrowing 50 for six months at the risk-free rate
d) You can arbitrage this price by buying the stock at 50 and lending 49.38 for six months at the risk-free rate
e) You can arbitrage this price by selling the stock short at 50 and lending 50 for six months at the risk-free rate

Work Shown (4 points)

Answer is_____
17. (Bonus 4+1=5 marks) The price of a stock is currently selling for 39.35. The next dividend payable one year from today is expected to be 1.00. Suppose the price included a forecasted future growth rate of 6% for the dividends. What is the annual effective interest rate, \( i \)?

a) 2.54%
b) 3.15%
c) 3.46%
d) 6.00%
e) 8.54%

Work Shown (4 points)

18. Bonus (4+1=5 marks) Below is a 4-year yield curve with one missing entry.

<table>
<thead>
<tr>
<th>Years to Maturity</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>Zero Coupon Bond yield</td>
<td>3.0%</td>
<td>4.0%</td>
<td>5.0%</td>
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The theoretically correct yield for a 4-year fixed interest rate swap is 4.94%. Find the range for the missing spot rate in the table above.

a) 4.00% - 4.15%
b) 4.16% - 4.3%
c) 4.31% - 4.45%
d) 4.46% - 4.6%
e) 4.61% - 4.75%

Work Shown (4 points)

Answer is ______