

MAP 4170 – 01
Test 3

Instructor: Steve Paris
Date: November 22, 2005

Each problem is worth 10 points. Use correct notation.

1. Esther invests 100 at the end of each year for 12 years at an annual effective interest rate of i . The interest payments are reinvested at an annual effective rate of 5%. The accumulated value at the end of 12 years is 1748.40. Calculate i .

- a. 6%
- b. 7%
- c. 8%
- d. 9%
- e. 10%

2. A loan of 1000 is being repaid in 10 years by semiannual installments of 50, plus interest on the unpaid balance at 4% per annum compounded semiannually. The installments and interest payments are reinvested at 5% per annum compounded semiannually. Calculate the annual effective yield rate of the loan.

- a. .046
- b. .048
- c. .050
- d. .052
- e. .054

3. John borrows 10,000 for 10 years and uses a sinking fund to repay the principal. The sinking fund deposits earn an annual effective interest rate of 5%. The total required payment for both the interest and the sinking fund deposit made at the end of each year is 1445.04. Calculate the annual effective interest rate charged on the loan.
- a. 5.5%
 - b. 6.0%
 - c. 6.5%
 - d. 7.0%
 - e. 7.5%

4. Bob takes out a loan of 1000 at an annual effective interest rate of i . You are given:
- (i) The first payment is made at the end of year 6.
 - (ii) Ten equal annual payments are made to repay the loan in full at the end of 15 years
 - (iii) The outstanding principal after the payment made at the end of year 10 is 908.91.

Calculate the outstanding principal at the end of year 5.

- a. 1390
- b. 1420
- c. 1450
- d. 1480
- e. 1510

5. Joe repays a loan of 10,000 by establishing a sinking fund and making 20 equal payments at the end of each year. The sinking fund earns 7% effective annually.

Immediately after the fifth payment, the yield on the sinking fund increases to 8% effective annually. At that time, Joe adjusts his sinking fund payment to X so that the sinking fund will accumulate to 10,000 20 years after the original loan date.

Determine X .

- a. 195
 - b. 200
 - c. 205
 - d. 210
 - e. 215
6. John invests a total of 10,000. He purchases an annuity with payments of 1000 at the beginning of each year for 10 years at an effective annual interest rate of 8%. As annuity payments are received, they are reinvested at an effective annual interest rate of 7%

The balance of the 10,000 is invested in a 10-year certificate of deposit with a nominal annual interest rate of 9%, compounded quarterly.

Calculate the annual effective yield rate on the entire 10,000 investment over the 10 year period.

- a. 7.85%
- b. 7.95%
- c. 8.05%
- d. 8.15%
- e. 8.25%

7. A 1000 loan is repaid with equal payments at the end of each year for 20 years.

The principal portion of the 13th payment is 1.5 times the principal portion of the 5th payment.

Calculate the total amount of interest paid on the loan.

- a. 632
 - b. 642
 - c. 652
 - d. 662
 - e. 672
8. It is known that $1 + i_t^y = (1.08 + .005t)^{1+.01y}$ for integral t , $0 \leq t \leq 5$, and integral y , $0 \leq y \leq 10$. If 1000 is invested for three years beginning in year $y = 5$, find the equivalent level annual effective rate of interest.
- a. .088
 - b. .090
 - c. .092
 - d. .093
 - e. .095

9. A loan is amortized over five years with monthly payments at a nominal interest rate of 9% compounded monthly. The first payment is 1000 and is to be paid one month from the date of the loan. Each succeeding monthly payment will be 2% lower than the prior payment.

Calculate the outstanding loan balance immediately after the 40th payment is made.

- a. 6751
 - b. 6889
 - c. 6941
 - d. 7030
 - e. 7344
10. You are given the following information about the activity in two different investment accounts:

Account K: Balance on 1/1/2003 is 100. Balance on 7/1/2003 is 125 and then a withdrawal of X is made. Balance on 10/1/2003 is 110 and then a deposit of $2X$ is made. Balance on 12/31/2003 is 125

Account L: Balance on 1/1/2003 is 100. Balance on 7/1/2003 is 125 and then a withdrawal of X is made. Balance on 12/31/2003 is 105.80.

During 2003 the dollar weighted return for investment Account K equals the time weighted return for investment Account L, which equals i .

Calculate i .

- a. 10%
- b. 12%
- c. 15%
- d. 18%
- e. 20%