Practice Test 2

1. You purchase a house with a $1,000,000, 30 year mortgage at 7.5% interest, converted monthly. (Actuaries live well!)
   (a) What is your monthly payment?
   (b) Use the **PROSPECTIVE METHOD** to determine the outstanding amount of the loan after the 120th payment. SHOW WORK!
   (c) Use the **RETROSPECTIVE METHOD** to determine the outstanding amount of the loan after the 240th payment. SHOW WORK!
   (d) How much of the 241st payment goes into principal?

2. Compute the purchase price of a $5000 par value 8 year bond with 6% semianual coupons if the bond is purchased to yield 7% interest, compounded semianually.

3. For the bond in problem 2, what is the amount of interest in the 5th coupon.

4. I borrow $5,000 for 15 years at an annual effective interest rate of 6%. Assuming that I pay $C/year continuously, find $C$.

5. I take out a loan at a premium on which I pay $200 every half year for the next 15 years together with an additional payment of $10,000. The amount of interest in the 10th payment is $80. What is the interest rate on the loan? What was the original amount of the loan?

6. Answer question 5 under the assumption that the loan was taken out at a discount.

7. I take out a loan at 7% annual effective interest which I pay off with 10 equal payments of $C$. The amount of interest paid in the 7th payment is 30$. Find $C$.

8. An insurance company owns an $N$ year bond with semianual premiums. The amount of the principal adjustment in the 7th premium $12.8$ and the amount of the principal adjustment in the in the 10th premium is $14$. What is the yearly yield rate on the bond, converted semianually?

9. Answer question 8 under the assumption that the bond was bought at a premium.

10. A 12 year $9,000 bond with 10% semianual coupons is sold just after the 10th coupon is paid for a price $P$ that yields a 7% return over the remaining life of the bond. Compute $P$.

11. A 10 year $3,000 bond with 4% semianual coupons has a yield rate of 5%. (a) What is the book value just after the 12th coupon is paid? (b) What is the book value just before the 13th premium has been paid?

12. I take out a $10,000, 15 year loan at 8% interest, annual effective, which I pay for using yearly payments from a sinking fund. If the sinking fund yields 6.5 % annual effective, what is the effective interest rate on my loan?

13. I have a 10 year student loan at 8.4 % per year, converted monthly, on which I pay $300/month. At the end of 3 years, I renegotiate my loan, obtaining a 6% interest rate, converted monthly, and payments of$200 month. How many more years must I pay on this loan?

14. Fred takes out a 7 year loan for $1700 at 7% interest, converted 4 times a year on which he pays daily. What is his daily payment?
15. A $50,000, 20 year loan is repaid by making equal payments at the end of each year. The amount of principal in the 10th payment is $2,219.46 while the amount of principal in the 13th payment is $2,749.54. What is the yearly payment?

16. The Purdue Credit Union gave Pete a $5,000, 10 year loan at 9% interest on which Pete makes annual payments. The Credit Union invests Pete’s payments at 5% annual effective. At the end of the 7th year, instead of making the 7th payment, Pete pays off the loan early by paying the outstanding balance, at which time the Credit Union also liquidates its investment. What is the Credit Union’s total rate of return on this loan?

17. I borrow X, which I repay by making 15 annual payments at the end of each year into a sinking fund which earns 7% annual effective. The interest earned in the sinking fund in the 5th year is $112.14. What is X?

18. I run an auto leasing company that leases cars for 5 years, after which we sell the car. In year 3, the depreciation charge on a $20,000 car is reported to be $1,934.58.

   (a) What is the salvage value for the car if I am using the sinking fund depreciation method with \( j = 6.2\% \)?

   (b) What is the salvage value for the car if I am using the sum of the digits depreciation method?

   (c) What is the salvage value for the car if I am using the compound discount depreciation method?

19. Suppose that car rental company described in problem 18, rents a $25,000 car for 5 years, after which the car can be sold for $10,000. What is the most they should they be willing to pay for a car which will last for 7 years and have the same salvage value at the end. Assume that both cars have the same yearly maintenance cost and that the interest rate is 6.2\%.