

## SAMPLE PROBLEMS FOR EXAM I

### MATH 630 Actuarial Math, 2/20

For the exam show your work to ensure credit for the solution of each problem. Put a box around the answer to each problem. No use of calculators, books or notes is allowed. No use or viewing of electronic devices is allowed.

1. The amount of 1000 is deposited in an account that for the first three years pays 12% convertible quarterly. For the following two years the effective annual interest rate is 8%. Find the value of the account at the end of five years.
2. The amount of 100 is deposited in an account that for the first four years pays 8% compounded semiannually. For the following three years the account is paid 12% converted quarterly. Find the value of the account at the end of seven years.
3. Jane and Mary have equal amounts of money to invest. Jane purchases a 10 year annuity with annual payments of 2500 at the beginning of each year. Mary invests her money in a savings account earning 9% effective annual interest for two years. At the end of two years, she purchases a 15 year annuity with annual payments of  $Z$  at the end of each year. Both annuities are valued using an effective annual rate of 8%. Find the value of  $Z$ .
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 20<sup>th</sup> year increases by 5% from the previous payment. Calculate the present value of these payments at the time the fifth payment is made using an annual effective rate of 7%.
5. John borrows 15,000 from a trust company at 12 percent effective annual interest. He pays  $X$  which includes the interest annually and the creation of a sinking fund which will repay the loan at the end of 15 years. Determine the annual sinking fund payment. The sinking fund accumulates at 12 percent annually.

6. A loan of 1000 is repaid by annual payments of 150 plus a smaller final payment. If  $i = .11$  and the first payment is made one year after the time of the loan, find the amounts of principal and interest contained in the third payment.
7. A loan of 50,000 is being repaid with semiannual payments for 10 years at 13 percent convertible semiannually. The first payment is due six months after the loan is taken. Find the outstanding balance at the end of the sixth year.
8. Deposits of 1000 are placed in a fund at the end of each year for the next 25 years. Five years after the last deposit, annual payments commence and continue forever. If  $i = .10$  for both deposits and perpetuity payments find the amount of each payment.