

**Memorial University of Newfoundland
Department of Mathematics and Statistics**

Final Examination

Mathematics 2090

Fall 2012

Instructor: M. S. Grewal

December 6, 2012

Time: 9:00 to 11:00 A.M

Room: HH 3026

Student's Last Name (Please print).....

First Name.....

Student Number.....

Instructions:

- **The examination consists of 10 questions on 11 pages.**
- **Total mark for the examination is 50.**
- **Formulae sheet and calculator are permitted.**
- **Show your work and answers clearly in the space provided.**
- **Relax! Good Luck!**

1. At a certain rate of simple interest, 2000 will accumulate to 2600 after a certain period of time. Find the accumulated value of 1000 at a rate of simple interest $\frac{3}{4}$ as great over twice as long a period of time. [5 marks]

2. Prove each of the following identities mathematically.

a. $i\sqrt{1-d} = d\sqrt{1+i}$ [2 marks]

b. $\frac{1}{d^{(m)}} - \frac{1}{i^{(m)}} = \frac{1}{m}$ [3 marks]

3. A loan is being repaid by monthly payments of 200, the first due one month after the loan is taken out, along with a smaller final payment. If $i = 0.11$ and the loan balance at the end of 18 months is 5,000, find the amount of the original loan. [5 marks]

4. Paula wishes to accumulate 85,000 in a fund at the end of 25 years. If she deposits 1000 in the fund at the end of each of the first 10 years, and $1000 + x$ at the end of each of the last 15 years, find x if the fund earns 7% effective. [5 marks]

5. A fund of 2200 is to be accumulated at the end of 10 years, with payments of 100 at the end of each of the first 5 years and 200 at the end of each of the second 5 years. Find the effective rate of interest earned by the fund. [5 marks]

6. A loan is repaid by 20 equal annual payments at 11% effective. If the amount of principal in the 4th payment is 150, find the amount of interest in the 12th payment. [5 marks]

7. Find the price which should be paid for an annuity of 500 per year for the next 10 years, if the yield rate is to be 11% and if the principal can be replaced by a sinking fund earning 8% per year for the next 6 years and 7% per year for the following 4 years after that. [5 marks]

8. Derive the following price formula for bonds

$$P = C + (Fr - C) a_{\overline{n}|i}$$

[5 marks]

9. Cornelius is repaying a loan with payments of 3000 at the end of every two years. If the amount of interest in the 5th instalment is 2,982.31, find the amount of principal in the 8th instalment. Assume $i = 0.13$.
[5 marks]

10. A 10-year 1000 face value bond, redeemable at par, earns interest at 9% convertible semi-annually and to yield an investor 8% convertible semi-annually. Construct the $t = 8$ and $t = 17$ rows of the amortization schedule. [5 marks]