University of Saskatchewan

College of Engineering

GE 348.3 Engineering Economics

Midterm Examination

Time: 50 minutes February 22, 2006

- WebCT notes **ONLY** are allowed
- Be neat
- Show all work
- Place **ALL** answers in the box
- Write your name and student number

Question	Marks Availible	Marks Obtained
1	40	39
2	25	25
3	35	35
TOTAL	**100**	99

Name: JARED EPP

Student Number: 917437

40 Marks 1. You just bought your first home for $135,500 and placed 15% as a down payment. You also had to pay CMHC insurance on the loan amount which can be calculated as 2.65% of the remaining principle. You also decide to finance the CMHC insurance. A mortgage broker gave you a nominal interest rate of 5% compounded monthly with a 20 year amortization period. The term of the mortgage is five years. What are the monthly payments on the mortgage and what is the total interest paid over the life of the mortgage?

ing when term is
paid principle is
ced at some rate.

39

se - 135,000

n = 135,000(0.15) = 20250

ning principle = 135,000 - 20250 = 114750

nce = 114750 · 0.0265 = 3040.88

to finance = 3040.88 + 114750 = 117790.88

$P = 117{,}790.88$

$i = \frac{0.05}{12} = 0.0041\overline{6}$

$N = 20 \times 12 = 240$

$$\left[\frac{i(1+i)^N}{(1+i)^N - 1}\right] = 117{,}790.88\left[\frac{0.004167(1.004167)^{240}}{(1.004167)^{240} - 1}\right] = 777.37$$

cal paid = 777.37 · 240 = 186 568.23

tal financed = = -117 790.88

nterest Paid = 68 777.35

eck

$$= A\left[\frac{(1+i)^N - 1}{i(1+i)^N}\right] = 777.37\left[\frac{(1.004167)^{240} - 1}{.004167(1.004167)^{240}}\right] = 117\,787.29$$

780

Monthly payments:	$777.37
Total interest:	$68,777.35

25 Marks **2.** A Mortgage Broker quoted you an unbelievable 6 year term mortgage rate of 3.95% interest rate which is compounded semi-annually. Your current job pays you weekly and you plan to make your mortgage payments coincide with your paychecks. What is the effective weekly interest rate?

Interest rate given: 3.95%/year compounded every 6 months

25

$\frac{3.95\%}{2} = 1.975\%/6\text{months}$ compounded every 6 months.

$r = 1.975\% = 0.01975$

$k = 26$ (26 weeks in 6 months)

$c = 1/26$

$$i_k = \left[1 + \frac{r}{ck}\right]^c - 1 = \left[1 + \frac{0.01975}{1}\right]^{\frac{1}{26}} - 1 = 0.07525\%$$

Check → 1000 for 6 months

$F = P(1+i)^N$

$F = 1000(1.01975)^1$ $\quad$ $F = 1000(1.0007525)^{26}$

$F = 1019.75$ $\quad$ $F = 1019.75$ ✓

Effective interest rate:	0.07525%

35 Marks **3.** You notice a sign in the local bank that is advertising an "<u>Elevator GIC</u>" and in large font the ad states that you "**Earn 10% in the Final Year**". There is no doubt that earning 10% on a GIC is an excellent rate since there is little to no risk associated with investment. Intrigued and excited, you read on and notice in the fine print that the investment yields 1.5% in the first 3 years, 2.5% in the fourth year, followed by the 10% rate in the final and fifth year. In order to make a wise investment you must calculate the "Actual" rate of return normalized over the five year period. Clearly state your assumptions below.

35

Assuming a \$1000 initial investment, and interest compounded yearly.

1st 3 years: $F = P(1+i)^N = 1000(1.015)^3 = 1045.68$

4th year : $F = 1045.68(1.025)^1 = 1071.82$

5th year : $F = 1071.82(1.1)^1 = 1179.00$

Actual return: $F = P(1+i)^N \rightarrow \frac{F}{P} = (1+i)^N \rightarrow \left(\frac{F}{P}\right)^{\frac{1}{N}} = 1+i \rightarrow i = \left(\frac{F}{P}\right)^{\frac{1}{N}} - 1$

$i = \left(\frac{1179.00}{1000.00}\right)^{\frac{1}{5}} - 1 = 3.348\%$ ✓

check

$F = P(1+i)^N$

$F = 1000(1.03348)^5$

$F = 1178.99$ ✓

✓

Actual normalized rate of return over the five year period:	3.348%