

ADM 2350N  
February 25, 2013

Midterm Examination Name: \_\_\_\_\_  
Version #1 Solutions Student ID #: \_\_\_\_\_

**Statement of Academic Integrity**

The Telfer School of Management does **NOT** condone academic fraud, an act by a student that may result in a false academic evaluation of that student or of another student. Without limiting the generality of this definition, academic fraud occurs when a student commits any of the following offences: plagiarism or cheating of any kind, use of books, notes, mathematical tables, dictionaries or other study aid unless an explicit written note to the contrary appears on the exam, to have in his/her possession cameras, radios (radios with head sets), tape recorders, pagers, cell phones, or any other communication device which has not been previously authorized in writing.

**Statement to be signed by the student:**

I have read the text on academic integrity and I pledge **NOT** to have committed or attempted to commit academic fraud in this examination.

Signed: \_\_\_\_\_

Note: an examination copy or booklet without that signed statement will **NOT** be graded and will receive a midterm exam grade of **ZERO**.

**General Instructions:**

1. Please **SIGN** the academic integrity statement above.
2. Please put your **Name and Student ID# on ALL NINE pages** of this exam.
3. This is an **open book and open notes exam**. Notes are **any handwritten or printed materials**, including but not limited to, previous assignments, quizzes, and exams plus their solution sets.
4. The use of **scientific and financial calculators is encouraged**.
5. **Laptop computers or any other devices that can be used for communication are NOT permitted**.
6. Please **do NOT take apart the pages** of this exam.
7. You have **1 hour and 10 minutes** to work this exam.
8. Good Luck!

There are **FOUR multiple-choice problems** on this exam. Each problem counts 5 marks for a total of 20 marks for this exam. **To receive credit for each problem, you must show your work!**

1. Mary Marson wishes to retire on her **75<sup>th</sup>** birthday. She wants to withdraw **\$80,000** on each of her **75<sup>th</sup>** through **99<sup>th</sup>** birthdays (i.e. **25** withdrawals). Her life expectancy is **100** years, and she wishes to leave to her heirs **\$500,000** at that time. (Just in case she does live longer than 100 years, she will dip into the \$500,000!) Assuming an interest rate throughout her life of **3%**, **(1)** how much must Mary accumulate by age **75 BEFORE** making her first withdrawal to be able to provide for her retirement years and her bequest of \$500,000 and **(2)** how much must Mary deposit at the **END** of each year for **fifty-five** years, assuming she **starts her plan at age 20** with deposits on her **21<sup>st</sup>** through **75<sup>th</sup>** birthdays with the deposit on her **75<sup>th</sup>** birthday occurring immediately **BEFORE** her withdrawal on that birthday.
- a. \$1,393,051.82,    \$ 9,939.45
  - b. \$1,393,051.82,    \$10,237.64
  - c. \$1,434,843.37,    \$10,237.64
  - d. \$1,434,843.37,    \$10,544.77
  - e. \$1,631,854.60,    \$11,643.32
  - f. \$1,631,854.60,    \$11,992.62
  - g. \$1,673,646.15,    \$11,941.50
  - h. \$1,673,646.15,    \$12,299.74**
  - i. \$2,500,000.00,    \$17,837.55
  - j. \$2,500,000.00,    \$18,372.68
  - k. None of the above.

$$PV_{55} = \$80,000 \cdot 1.03 \cdot PVIFA_{3\%,25} + \$500,000 \cdot PVIF_{3\%,25}$$

$$PV_{55} = \$80,000 \cdot 1.03 \cdot 17.41314769 + \$500,000 \cdot 0.4776055693$$

$$PV_{55} = \$1,434,843.37 + \$238,802.78 = \$1,673,646.15$$

$$PMT = \frac{FV_{55}}{FVIFA_{3\%,55}} = \frac{\$1,673,646.15}{136.0716197} = \$12,299.74$$

**ADDITIONAL SPACE IS PROVIDED FOR WORKING PROBLEM 1**

**Marking Scheme:**

**To receive any credit, you must show your work. To receive the credit in the marking scheme, you must make the indicated mistake(s). Otherwise, you may receive less or even zero credit for any answer.**

- 0 marks for answer a. as you (1) omitted the \$500,000 bequest, (2) calculated the PV of withdrawals as an annuity instead of an annuity due, and (3) calculated the PMT as an annuity due instead of an annuity
- 1 mark for answer b. as you (1) omitted the \$500,000 bequest, and (2) calculated the PV of withdrawals as an annuity instead of an annuity due
- 1 mark for answer c. as you (1) omitted the \$500,000 bequest and (2) calculated the PMT as an annuity due instead of an annuity
- 3 marks for answer d. as you (1) omitted the \$500,000 bequest
- 1 mark for answer e. as you (1) calculated the PV of withdrawals as an annuity instead of an annuity due and (2) calculated the PMT as an annuity due instead of an annuity
- 3 marks for answer f. as you (1) calculated the PV of withdrawals as an annuity instead of an annuity due
- 3 marks for answer g. as you (1) calculated the PMT as an annuity due instead of an annuity
- 5 marks for answer h. provided all your work is correct
- 0 marks for answer i. as (1) you completely ignored the time value of money in calculating the amount required at age 75 (i.e. 55 years from now) and (2) you calculated the PMT as an annuity due instead of an annuity
- 2 marks for answer j. as (1) you completely ignored the time value of money in calculating the amount required at age 75 (i.e. 55 years from now)
- 0 up to a maximum of 3 marks for answer k. depending on the nature of your mistake(s)

2. For **fiscal year 2013**, the Kahl Telephone Company (KTC) expects to pay dividends of **\$11,000.00** per share. Dividends are expected to **grow** from the **2013 dividend of \$11,000.00 at 10% compounded annually in fiscal years 2014 through 2017**, respectively. After that, dividends are expected to remain at the **fiscal 2017 level for fiscal years 2018 through 2019**. Thereafter, dividends are **DECREASE** at a compound rate of **10%** per year forever from the **fiscal 2019 level**. Stocks of similar risk yield **10%**. **To the nearest penny**, what should be the price of a share of KTC stock today at the **BEGINNING** of **fiscal 2013**?
- \$ 50,000.00
  - \$ 27,951.00
  - \$ 17,355.37
  - \$ 37,190.08
  - \$104,545.45**
  - \$ 72,472.95
  - \$ 59,895.00
  - \$ 87,846.00
  - \$ 54,545.45
  - \$ 55,000.00
  - None of the above.

**Step 1:** Calculate the PV of the dividends for years 1 – 7 (i.e. 2013 – 2019)

$$\begin{aligned} \sum_{t=1}^7 \frac{D_t}{(1+k)^t} &= \left\{ \frac{\$11,000}{1.10} + \frac{\$11,000 \times 1.10^1}{1.10^2} + \frac{\$11,000 \times 1.10^2}{1.10^3} + \frac{\$11,000 \times 1.10^3}{1.10^4} + \frac{\$11,000 \times 1.10^4}{1.10^5} \right\} \\ &+ \left\{ \frac{\$11,000 \times 1.10^4}{1.10^6} + \frac{\$11,000 \times 1.10^4}{1.10^7} \right\} \\ \sum_{t=1}^7 \frac{D_t}{(1+k)^t} &= \{5 \times \$10,000\} + \{PVIF_{10\%,5} \times \$11,000 \times 1.10^4 \times PVIFA_{10\%,2}\} \\ \sum_{t=1}^7 \frac{D_t}{(1+k)^t} &= \$50,000 + \{0.6209213231 \times \$11,000 \times 1.4641 \times 1.73553719\} \\ \sum_{t=1}^7 \frac{D_t}{(1+k)^t} &= \$50,000 + 0.6209213231 \times \$27,951 = \$50,000 + \$17,355.37 = \$67,355.37 \end{aligned}$$

NB. If one recognizes that  $\$11,000 \times 1.10^4 = \$10,000 \times 1.10^5$ , then the calculation of the PV of the 6<sup>th</sup> and 7<sup>th</sup> dividends simplifies to:

$$PV_0(D_6 \text{ \& } D_7) = \$10,000 \quad PVIFA_{10\%,2} = \$17,355.37$$

We, however, wanted to calculate the intermediate result  $PV_5 = \$27,951$  of the 6<sup>th</sup> and 7<sup>th</sup> dividends as they comprise part of the calculation of  $P_5$  obtained in answer h.

**ADDITIONAL SPACE IS PROVIDED FOR WORKING PROBLEM 2**

**Step 2a:** Calculate the price  $P_7$  at the **BEGINNING** of year 8 (i.e. **BEGINNING** of 2020)

$$P_7 = \frac{D_8}{k_c - g} = \frac{\$11,000 \cdot 1.10^4 \cdot 0.90}{0.10 + 0.10} = \$72,472.95$$

**Step 2b:** Calculate the PV of the price  $P_7$  at the **BEGINNING** of year 1 (i.e. **BEGINNING** of 2013)

$$PV_0(P_7) = \frac{\$72,472.95}{1.10^7} = \$37,190.08$$

**Step 3:** Calculate the price  $P_0$  as the sum of Steps 1 & 2b, viz.,  $P_0 = \$67,355.37 + \$37,190.08 = \$104,545.45$ .

**Marking Scheme:**

**To receive any credit, you must show your work. To receive the credit in the marking scheme, you must make the indicated mistake(s). Otherwise, you may receive less or even zero credit for any answer.**

- 2 marks for answer a. provided the student recognizes that this is the  $PV_0$  of the first 5 dividends
- 1 mark for answer b. provided the student recognizes that this is the  $PV_5$  of the 6<sup>th</sup> & 7<sup>th</sup> dividends
- 2 marks for answer c. provided the student recognizes that this is the  $PV_0$  of the 6<sup>th</sup> & 7<sup>th</sup> dividends
- 2 marks for answer d. provided the student recognizes that this is the  $PV_0$  of the price  $P_7$
- 5 marks for answer e. provided the student correctly calculates this price
- 1 mark for answer f. provided the student recognizes that this is  $P_7$
- 2 marks for answer g. provided the student recognizes that this is the  $PV_5 = \$59,895$  of the price  $P_7$
- 3 marks for answer h. provided the student recognizes that this is  $P_5 = \$27,951 + \$59,895 = \$87,846$
- 3 marks for answer i. provided the student recognizes that this is the  $PV_0 = \$87,846/1.10^5 = \$54,545.45$  of  $P_5$
- 0 marks for answer j. as one **cannot** use the Gordon model  $P_0 = D_1/(k_c - g) = \$11,000/(0.10 + 0.10) = \$55,000$
- 0 up to a maximum of 3 marks for answer k. depending on the nature of your mistake(s)

**NB.** Students may also find the correct  $P_0 = \$50,000 + \$54,545.45$  as the sum of the  $PV_0$  of the first five dividends and the  $PV_0$  of the price  $P_5$ . Students may even find the correct  $P_0 = (\$50,000 + \$9,090.909) + \$45,454.545 = \$104,545.45$  as the sum of the  $PV_0$  of the first six dividends and the  $PV_0 = \$80,525.50/1.10^6$  of the price  $P_6 = D_7/(k_c - g) = (\$11,000 \times 1.1^4)/(0.10 + 0.10) = \$80,525.50$ .

3. **Stock A has a beta of 1.40, Stock B has a beta of 0.80, the expected and required rate of return on an average stock is 15 percent, and the risk-free rate of return is 5 percent. By how much does the required rate of return on Stock A exceed the required rate of return on Stock B?**

- a. 5%
- b. 10%
- c. 15%
- d. 6%**
- e. 19%
- f. 4%
- g. 2%
- h. 13%
- i. 7%
- j. 8%
- k. None of the above.

(1)  $required\ return_A = RF + market\ risk\ premium \times \beta_A$

(2)  $required\ return_B = RF + market\ risk\ premium \times \beta_B$

Equation (1) - Equation (2) yields :

(3)  $required\ return = market\ risk\ premium \times (\beta_A - \beta_B) = (15\% - 5\%)(1.40 - 0.80) = 6\%$

#### **Marking Scheme:**

**To receive any credit, you must show your work. To receive the credit in the marking scheme, you must make the indicated mistake(s). Otherwise, you may receive less or even zero credit for any answer.**

0 marks for answer a. as this is the given risk-free rate

2 marks for answer b. provided that this is your calculation of the market risk premium

1 mark for answer c. provided that you recognize that the return on the average stock is  $ER_M$

5 marks for answer d. provided that you have correctly calculated the differential required return

3 marks for answer e. provided that you recognize that this is the required rate of return for Stock A

0 marks for answer f.

0 marks for answer g.

3 marks for answer h. provided that you recognize that this is the required rate of return for Stock B

0 marks for answer i.

0 marks for answer j.

0 up to a maximum of 3 marks for answer k. depending on the nature of your mistake(s)

**ADDITIONAL SPACE IS PROVIDED FOR WORKING PROBLEM 3**

4. Lara and Larry Davis wish to buy the home of their dreams in Huntsville, Ontario. The home costs **\$800,000**. The Scotiabank offers to lend them **80%** of the purchase price or **\$640,000** at a nominal annual rate of **6.00 percent compounded semi-annually** for a **term of 4 years** with an **amortization period of 20 years**. Since Lara and Larry have saved **\$160,000**, they are considering the Scotiabank mortgage. Since Lara and Larry are paid monthly, they elect **monthly mortgages payments** to match the frequency of their paycheques. **To the nearest penny**, what are their monthly mortgage payments? (**NB**. There are **EXACTLY 12** payments per year.)
- a. \$ 15,030.42
  - b. \$ 4,585.16
  - c. \$ 15,008.82
  - d. \$ 4,558.01**
  - e. \$160,000.00
  - f. \$ 13,333.33
  - g. \$ 2,666.67
  - h. \$161,980.31
  - i. \$ 33,685.26
  - j. \$ 32,000.00
  - k. None of the above.

$$k_{\text{monthly}} = \left(1 + \frac{0.06}{2}\right)^{2/12} - 1 = 0.004938622 \text{ or } 0.4938622\%$$

$$PMT = \frac{PV_0 \times k_{\text{monthly}}}{\left[1 - \frac{1}{(1 + k_{\text{monthly}})^{12 \times 20}}\right]} = \frac{\$640,000 \times 0.004938622}{\left[1 - \frac{1}{1.004938622^{240}}\right]} = \$4,558.01$$



**ADDITIONAL SPACE IS PROVIDED FOR WORKING PROBLEM 4**

**Marking Scheme:**

**To receive any credit, you must show your work. To receive the credit in the marking scheme, you must make the indicated mistake(s). Otherwise, you may receive less or even zero credit for any answer.**

- 1 marks for answer a. as you confused (1) the 48-month term and the 240-month amortization periods & (2) the quoted compounding frequency of 2 with the payment frequency of 12
- 3 marks for answer b. as you confused (1) the quoted compounding frequency of 2 with the payment frequency of 12
- 3 marks for answer c. as you confused (1) the 48-month term and 240-month amortization periods
- 5 marks for answer d. provided that you have correctly calculated the monthly payment
- 0 marks for answer e. as \$160,000 would be the annual PMT for 4 years with a **ZERO** interest rate
- 0 marks for answer f. as \$13,333.33 would be the monthly PMT for 48 months with a **ZERO** interest rate
- 0 marks for answer g. as \$2,666.67 would be the monthly PMT for 240 months with a **ZERO** interest rate
- 1 mark for answer h. as you (1) confused the 48-month term and 240-month amortization periods and (2) are paying off the loan in 4 months instead of the (albeit incorrect)  $4 \text{ years} \times 12 \text{ months/year} = 48 \text{ months}$
- 3 marks for answer i. as you are (1) paying off the loan in 20 months instead of  $20 \text{ years} \times 12 \text{ months/year} = 240 \text{ months}$
- 0 marks for answer j. as \$32,000 would be the annual PMT for 20 years with a **ZERO** interest rate
- 0 up to a maximum of 3 marks for answer k. depending on the nature of your mistake(s)