

**UNIVERSITY OF MANITOBA**  
**Faculty of Management**  
**Department of Accounting and Finance**

**9.220 Corporation Finance**  
**Mid-term Examination B**

**Professors: A. Dua, J. Falk, and R. Scott**  
**February 28, 2006; 6:30 p.m. - 8:30 p.m.**

**Note: it is your responsibility to verify that this examination has 16 pages.**

Name:
ID number:
Check (√) the section in which you are registered.
L04 Scott, T/Th 8:30 – 9:45                    _____ L05 (Falk, T/Th 10:00 – 11:15)            _____ L06 (Falk, T/Th 11:30 – 12:45)            _____ L07 (Scott, M/W 8:30 – 9:45)                _____ L08 (Dua, M/W 10:00 – 11:15)            _____ L09 (Falk, M/W 1:00 – 2:15)                _____ L10 (Falk, M/W 2:30 – 3:45)                _____

- Section I of the exam has 20 multiple-choice questions worth 1 mark **each**. Answer all multiple-choice questions on your bubble sheet.
- Section II of the exam contains 6 long-answer questions worth a total of 45 marks. Answer all questions in the spaces provided. **Show all relevant work** (i.e., formulas and substitutions). **DO NOT INDICATE WHICH CALCULATOR BUTTONS YOU HAVE PRESSED. Do not round any intermediate calculations.**
- Write or print legibly in the space provided for answering each long answer problem.
- **Rounding rules:**
  - Final dollar answers should be rounded to 2 decimal places, unless otherwise specified.
  - Final interest rate answers should be rounded to 4 decimal places if stated as a percentage, and 6 decimal places otherwise, unless otherwise specified.
  - Other final answers may be rounded to 6 decimal places, unless otherwise specified.
- **DO NOT FORGET TO RESET YOUR CALCULATOR AFTER EACH QUESTION TO “1 P/YR” AND PAYMENTS AT THE “END” MODE.**
- **GOOD LUCK AND ENJOY THE EXAM!**

<u>Question</u>	<u>Maximum Total Marks</u>	<u>Marks Awarded</u>
Multiple Choice	20	
Long Q. 1	5	
Long Q. 2	11	
Long Q. 3	7	
Long Q. 4	5	
Long Q. 5	14	
Long Q. 6	3	
<b>Total Marks</b>	<b>65</b>	

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**I. Multiple Choice Section:**

Each of the following questions is followed by several suggested answers or completions. Select the best alternative and fill in the corresponding space on the accompanying computerized answer sheet. (Value:  $20 \times 1 = 20$  points)

1. Calculate net income based on the following information.

Sales	\$250,000
Cost of goods sold	\$160,000
Depreciation	\$35,000
Interest paid	\$20,000
Tax rate	34%

- a) \$11,900  
b) **\$23,100**  
c) \$35,000  
d) \$36,300  
e) \$46,200
2. A financial manager's most important job is to create value from capital budgeting, financing, and liquidity activities. A financial manager creates value by  
a) buying assets that generate more than their cost.  
b) selling financial securities that raise more cash than they cost.  
c) minimizing cash payouts to non-investors such as payments of taxes to governments.  
d) **all of the above.**  
e) only a) and b) above.
3. Jordan has guaranteed incomes of \$23,200 at  $t = 0$  and \$24,360 at  $t = 1$ . He has no investment opportunities. If he chooses to consume \$15,000 at  $t = 0$ , and loan out the remainder, he can consume \$32,970 at  $t = 1$ . The equilibrium market rate of interest that is implied is  
a) 4%  
b) **5%**  
c) 6%  
d) 7%  
e) none of the above.
4. An individual with no investment opportunities has income of \$50,000 at  $t = 0$  and income of \$60,000 at  $t = 1$ . If the interest rate is 5%, which of the following consumption patterns is possible?  
a) \$0 in  $t = 0$  and \$112,000 in  $t = 1$   
b) \$20,000 in  $t = 0$  and \$90,500 in  $t = 1$   
c) **\$70,000 in  $t = 0$  and \$39,000 in  $t = 1$**   
d) all of the above  
e) none of the above
5. An individual has \$10,000 income in period 0 and \$50,000 income in period 1. If the individual desires to consume \$25,000 in period 1, the greatest consumption possible in period 0 is  
a) \$35,000.  
b) \$33,500.  
c) \$30,000.  
d) \$25,000.  
e) **not able to be determined from the information given.**

6. Ms. Cheapskate, who is 35 years old, has just inherited \$20,000 and decides to use the windfall towards her retirement. She places the money in a bank, which promises a return of 6% per year, compounded continuously until her planned retirement at age 60. On her retirement the \$20,000 inheritance will have grown to
- a) \$85,837.41
  - b) \$87,678.12
  - c) \$88,640.91
  - d) \$89,299.40
  - e) **\$89,633.78**
7. You have just won a lottery (lucky you!!!) and have been offered several options to receive your winnings. Assume the equilibrium market rate of interest is 8%. To maximize your return you would select
- a) 5 annual payments of \$100,000, starting 1 year from today. (PV = \$399,271.00)
  - b) 5 annual payments of \$92,000, starting immediately. (PV = \$396,715.67)
  - c) 60 monthly payments of \$8,000, starting one month from now. (PV = \$397,159.23)
  - d) 60 monthly payments of \$7,900, starting immediately. (PV = \$394,718.13)
  - e) **a single payment of \$400,000, paid immediately.**
8. An interest rate is quoted as 6%/year compounded semi-annually. This is the same as
- a) an effective annual rate of 6.09%.
  - b) an effective monthly rate of 0.5%.
  - c) a rate of 3.045%/6 months compounded annually.
  - d) **all of the above.**
  - e) **both a) and c) above.**
- Two possible correct answers.**
9. The yield to maturity of a bond that pays coupons semi-annually is
- a) the rate that equates the price of the bond with the discounted cash-flows.
  - b) the expected rate to be earned if held to maturity.
  - c) the rate that is used to determine the market price of the bond.
  - d) equal to the current yield for bonds priced at par.
  - e) **all of the above.**
10. Mortgage Instruments Inc. is expected to pay dividends of \$1.03 next year. The company has just paid a dividend of \$1 per share. This implied growth rate is expected to continue indefinitely. If the appropriate discount rate is 5%, the price that should be paid for Mortgage Instruments stock immediately after the \$1 dividend has been paid is
- a) \$20.
  - b) \$21.
  - c) \$34.
  - d) \$50.
  - e) **\$52.**
11. If its yield to maturity is less than its coupon rate, a bond will sell at a \_\_\_\_\_, and increases in market interest rates will \_\_\_\_\_.
- a) **premium, decrease this premium.**
  - b) premium, increase this premium.
  - c) discount, decrease this discount.
  - d) discount, increase this discount.
  - e) none of the above.
12. Given  $r_1 = 5.0\%$  and  $r_2 = 5.4\%$ , what can be deduced about investor's expectations of future short-term interest rates if the pure expectations hypothesis is correct?
- a) **Investors expect that future short-term rates will be greater than current short-term rates.**
  - b) Investors expect that future short-term rates will be less than current short-term rates.
  - c) Investors expect that future short-term rates will be equal to current short-term rates.
  - d) Investors expect that future short-term rates will always equal the yield to maturity on two year bonds.
  - e) none of the above.

13. What can be deduced about forward rates of interest if the liquidity premium hypothesis of the term structure is correct?
- The forward rate is less than investor's expectations of next year's one year interest rate.
  - The forward rate is greater than investor's expectations of next year's one year interest rate.**
  - The forward rate is equal to investor's expectations of next year's one year interest rate.
  - The forward rate is equal to the risk-free interest rate.
  - None of the above.
14. An investment project is most likely to be accepted by the payback period rule and **not** accepted by the NPV rule
- if the project has a large initial investment with moderate positive cash flows over a very long period of time.
  - if the project has a very large negative cash flow at the termination of the project.**
  - if the project has most of the cash flows at the beginning of the project.
  - under no circumstances.
  - because the payback period rule and the NPV rule cannot be used to evaluate the same type of projects.
15. The cash flow streams and the relevant information regarding two mutually exclusive projects are as follows:

<u>Year</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>NPV</u>	<u>IRR</u>
<b>Project A:</b>	-500	150	245	320	46.39	17.76
<b>Project B:</b>	-800	360	360	360	50.01	16.65

If the cost of capital is 13%, then

- according to the NPV rule project B should be selected over project A.
  - according to the IRR rule project A should be selected over project B.
  - the incremental IRR of project B over project A is 13.92% suggesting that project A should be selected over project B.
  - all of the above are true.
  - only a) and b) above are true.**
16. Gemini Corporation is considering the following four-year project:
- $$C_0 = \$20,000 \quad C_1 = -\$4,000 \quad C_2 = \$4,000 \quad C_3 = -\$3,000 \quad C_4 = -\$20,000$$
- If Gemini's opportunity cost of capital is 8%, then
- this project must have three IRR's.
  - this project has an NPV = \$2,643.56.**
  - this project should be rejected because its IRR > than the hurdle rate.
  - all of the above are true.
  - only b) and c) above are true.
17. Rockford Corporation is considering the following five-year project:
- $$C_0 = -\$20,000 \quad C_1 = C_2 = C_3 = C_4 = C_5 = \$5,000$$
- If Rockford's opportunity cost of capital is 10%, then
- the NPV of the project is \$849.33**
  - the project should be accepted because its IRR > the hurdle rate.**
  - the PI of the project is 1.042466**
  - all of the above are true.**
  - only a) and b) above are true.**
- Each student is given a point as the correct answer is not available!**

18. Grandpa Scott is considering retirement. His financial analyst recommends that he acquire a retirement annuity that will pay real cash flows of \$50,000 per year. The expected inflation rate per year is an effective annual rate of 2.5%. The effective nominal discount rate is quoted as 10.9675% per year. The expected growth rate in the **real** cash flows is
- a) -2.5%
  - b) -2.439024%
  - c) 2.439024%
  - d) 2.5%
  - e) **none of the above.**
19. Colgate is analyzing the feasibility of producing a special St. Patrick's Day toothpaste (green in colour) for distribution in March. If this toothpaste is produced, 300 machine hours will be taken away from existing product lines. Colgate's analysts give the following dollar amounts and/or estimates related to the new toothpaste.
- |  |           |
|--|-----------|
| PV of additional sales of St. Patrick's Day toothpaste   | \$600,000 |
| PV of cost of 300 machine hours                          | 195,000   |
| PV of sales lost by Colgate's other brands of toothpaste | 325,000   |
| Consulting fees paid re marketing analysis               | 90,000    |
- The \$600,000, \$195,000, \$325,000, and \$90,000 amounts listed above respectively correspond to
- a) incremental cash flow, sunk cost, side effects, opportunity cost.
  - b) incremental cash flow, sunk cost, sunk cost, side effects.
  - c) opportunity cost, sunk cost, incremental cash flow, side effects.
  - d) opportunity cost, side effects, incremental cash flow, sunk cost.
  - e) **none of the above.**
20. Fortitude Company is considering one of two possible asset investments. Asset #1 would cost \$20,000 and could be placed in a 25% CCA class. Asset #2 would cost \$25,000 and could be placed in a 20% CCA class. Asset #1 would have no salvage value after 5 years, whereas asset #2 would have a salvage value of \$5,000 after 5 years. Assuming that the "half-in-the-first-year" rule is in effect, that Fortitude would always take its maximum CCA deduction, that Fortitude's cost of capital is 10%, and that Fortitude's tax rate is 40%, then
- a) for year 2, the CCA tax shield from asset #2 would exceed that of asset #1 by \$50.
  - b) for year 3, the CCA deduction for asset #2 would exceed that of asset #1 by \$318.75.
  - c) the present value of the CCA tax shield from asset #1 equals that of asset #2.
  - d) all of the above are true.
  - e) **only a) and b) above are true.**

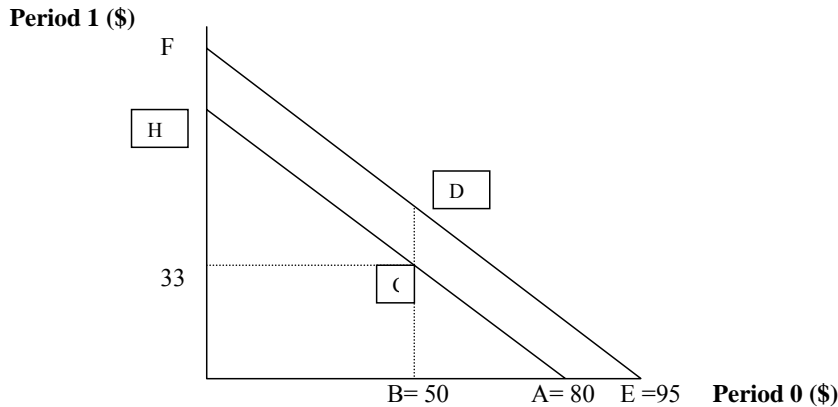
**The Long Answer section continues on the next page**

**II. Long Answer Section: (45 marks)**

Answer each question in the spaces provided. Show all relevant work (i.e., formulas and substitutions). Do **NOT** indicate which buttons were pushed on your calculator. **Do not round any intermediate calculations.** Final dollar answers should be rounded to two decimal places. Final interest rate answers should be rounded to 4 decimal places if stated as a percentage (12.345678%), or 6 decimal places if expressed as a decimal (0.123456787) unless otherwise specified. Other final answers may be rounded to 6 decimal places, unless otherwise specified.

**Problem One (5 marks)**

The following graph depicts the financial situation of Ms. Fawn.



In period 0 her labour income and current consumption is \$50; later in period 1, her labor income and consumption will be \$33. She has the opportunity to make the investment represented by point D. By borrowing and lending she will be able to reach any point along the line FDE.

1. Determine the market rate of interest? (2 marks)

$$\begin{aligned}
 -(1+r) &= \text{slope of FE} \\
 &= \frac{33-0}{50-80} \\
 r &= 10\%
 \end{aligned}$$

**Proposed key: 1 mark for concept of slope; 1 mark for substitution and answer. (½ off for calculation error.)**

2. What is the NPV of Point D? (1 mark)

$$NPV = \$95 - \$80 = \$15$$

**Proposed key: 1 or 0**

3. If Ms. Fawn wishes to consume the same quantity in each period, how much should she consume in period 0, assuming she takes the investment? (2 marks)

**Her wealth is \$95.**  
**Let C denote consumption, she can consume**

$$\begin{aligned}
 C + \frac{C}{1+r} &= \text{wealth} \\
 C + \frac{C}{1.1} &= 95 \\
 C &= \$49.76
 \end{aligned}$$

Proposed key: 1 for basic equation & concept; 1 for substitute and solve. 1 mark off per error

Alternative solution:

Investment return:

$$NPV = -C_0 + \frac{C_1}{1+r}$$

$$15 = -50 + \frac{C_1}{1.1}$$

$$C_1 = \$71.50$$

Period 0: Consumption = income – investment + borrowing

Period 1: Consumption = income + investment return – repayment of loan

Period 0 consumption = Period 1 consumption

$$50 - 50 + x = 33 + 71.50 - x(1.1)$$

$$x = \$49.76$$

$$\text{and } C = \$49.76$$

Proposed key: (½ to find  $C_1$ ; ½ to set up equality; ½ for substitution & solving; ½ for further solution for C.

**Problem Two (11 marks)**

1. Calculate the indicated interest rate in each of the following.  
 a) Calculate the effective annual interest rate equivalent to an interest rate of 10%/year compounded continuously. (1 mark)

$$\begin{aligned} r_{\text{annual}} &= e^{r_{\text{cc}}} - 1 \\ &= e^{0.1} - 1 \\ &= 10.517092\% \end{aligned}$$

**Proposed key: (1 or 0)**

- b) You have been given an interest rate of 4% per day, compounded annually. Find the equivalent rate per year, compounded daily. (2 marks)

$$\begin{aligned} \text{effective annual rate} &= 0.04 \times 365 = 14.60\% \\ \text{effective daily rate} &= (1 + 14.6\%)^{1/365} - 1 \\ &= 0.7555167\% \\ \text{stated rate} &= 0.7555167\% \times 365 \\ &= 275.763594\%/year \text{ compounded daily} \end{aligned}$$

**Proposed key: (½ to find effective annual rate; 1 to find effective daily rate; ½ to find stated rate; ½ off per error in calculations.)**

2. You wish to obtain a mortgage on your house. The house cost is \$120,000 and you have enough money for a 10% down payment. The First Canadian Bank (FCB) offers you a mortgage rate of 4.75% per year, amortized over 20 years.

- a) Determine your monthly mortgage payment (the first payment is one month from today). (2 marks)

$$\begin{aligned} \text{effective 6 month rate} &= 4.75\% / 2 \\ &= 2.375\% \\ \text{effective monthly rate} &= (1.02375)^{1/6} - 1 \\ &= 0.39197215\% \end{aligned}$$

$$\begin{aligned} PV &= \frac{C}{r} \left[ 1 - \frac{1}{(1+r)^T} \right] \\ 120,000(0.90) &= \frac{C}{0.0039197215} \left[ 1 - \frac{1}{(1.0039197215)^{240}} \right] \\ C &= \$695.15 \end{aligned}$$

**Proposed key: (½ × 2 = 1 for interest conversions; 1 for formula and substitutions with ½ of per error.)**

- b) Assume that the monthly payment you calculated above was \$523.15 and that the interest rate you used in your payment calculations was 0.5%. Five years into the mortgage, you decide you want to pay off your mortgage faster by exercising FCB's "double-up" option. That is, you want to make two payments of \$523.15 each month; one payment in the middle of the month, and one payment at the end of the month. By how many months (rounding to the nearest whole month) will you shorten the life of your payments if you take the "double-up" approach? (4 marks)

**The principal amount of the mortgage remaining after five years of payments is:**



$$PV = \frac{C}{r} \left[ 1 - \frac{1}{(1+r)^T} \right]$$

$$PV = \frac{523.15}{0.005} \left[ 1 - \frac{1}{(1.005)^{(15 \times 12)}} \right]$$

$$PV = \$61,995.11$$

$$\text{effective half month rate} = (1.005)^{1/2} - 1$$

$$= 0.24968828\%$$

The number of half months required to pay off the mortgage is:

$$PV = \frac{C}{r} \left[ 1 - \frac{1}{(1+r)^T} \right]$$

$$61,995.11 = \frac{523.15}{0.0024968828} \left[ 1 - \frac{1}{(1.0024968828)^T} \right]$$

$$T = 140.67845348 \text{ half months}$$

$$\# \text{ of months} = 140.67845348/2$$

$$= 70.33922674 \text{ months}$$

$$\# \text{ of months saved} = (12 \times 15) - 70.33922674$$

$$= 109.66077326 \text{ or } 110 \text{ months.}$$

**Proposed key: (1 for determining remaining amount of mortgage; 1 for effective semi-monthly rate; 1 for # of half months required; 1 for calculation of time saved.)**

- c) Instead of moving into your new house, you decide to rent it out to your friend. If you price the rent payments such that you will get rid of your debt in 12 years, what is the minimum amount of rent should you be charging your friend to rent the house? Your friend will make rent payments at the end of every year and the **monthly effective rate is 0.5%**. (2 marks)

$$\text{Effective annual rate} = (1.005)^{12} - 1 = 6.16778119\%$$

$$\text{effective annual rate} = (1.005)^{12} - 1$$

$$= 6.16778119\%$$

$$PV = \frac{C}{r} \left[ 1 - \frac{1}{(1+r)^T} \right]$$

$$120,000(0.90) = \frac{C}{0.0616778119} \left[ 1 - \frac{1}{(1.0616778119)^{12}} \right]$$

$$C = \$13,000.67$$

**Proposed key: (1 for rate change; 1 for the annuity calculation.)**

**Problem Three (7 marks)**

The Webster Co. has just paid a dividend of \$5.25 per share. The company will increase its dividend by 14 percent next year. The company will then reduce its dividend growth rate by 3 percent each year until the dividend reaches the industry average of 5% growth. The company will then maintain that growth rate, forever. The required rate of return for the Webster Co. is 15 percent.

1. What is the current price of the stock? (6 marks)

$$P_0 = \frac{\$5.25(1.14)}{1.15} + \frac{\$5.25(1.14)(1.11)}{1.15^2} + \frac{\$5.25(1.14)(1.11)(1.08)}{1.15^3} + \left[ \frac{\$5.25(1.14)(1.11)(1.08)(1.05)}{(.15 - .05)} \right] \cdot \left( \frac{1}{(1.15)^3} \right)$$

$$P_0 = \frac{\$5.985}{1.15} + \frac{\$6.64335}{1.15^2} + \frac{\$7.174818}{1.15^3} + \left[ \frac{\$7.5335589}{(.15 - .05)} \right] \cdot \left( \frac{1}{(1.15)^3} \right)$$

$$P_0 = \$5.20434783 + \$5.02332703 + \$4.71755930 + \$49.53437265$$

$$P_0 = \$64.48$$

**Proposed key: (1 for each of the terms until the perpetuity; 1 mark for the perpetuity term plus 1 mark for the appropriate discounting. 1 for correct answer.)**

2. Ignore your answer in part a) and assume that the price of the stock is currently \$50.00. Also, assume that the first dividend of the final growth rate is \$15.00. What is the price of the stock expected to be at the time that the \$15.00 dividend occurs? (1 mark)

$$P = \$15.00 + \frac{\$15.00(1.05)}{(.15 - .05)}$$

$$P = \$172.50$$

Also accept \$157.50 as correct answer.

**Proposed key: (1 or 0. Alternative solution method exists of \$15.00/(0.14-0.05) x 1.14)**

**Problem Four (5 marks)**

As the chief financial officer of the Orient Express, you are offered the following two **mutually exclusive** projects.

<u>Year</u>	<u>Cash Flow \$</u>	
	<u>Project A</u>	<u>Project B</u>
0	-5,000	-100,000
1	3,500	65,000
2	3,500	65,000

1. Determine the IRR's of each of these two projects. Be sure to show the appropriate equations (1 mark)

$$NPV_A = C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2}$$

$$0 = -5,000 + \frac{3,500}{1+IRR} + \frac{3,500}{(1+IRR)^2}$$

$$IRR = 25.691786\%$$

$$NPV_B = C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2}$$

$$0 = -100,000 + \frac{65,000}{1+IRR} + \frac{65,000}{(1+IRR)^2}$$

$$IRR = 19.426693\%$$

**Proposed key:** (½ mark for equation setup showing NPV=0; ½ mark for **both** IRR's.)

2. If you were told only the IRR's of each project and that both IRR's were greater than the hurdle rate, you would choose Project A because it has the higher IRR of the two investment projects and it's IRR is greater than the hurdle rate. (½ mark)

**Proposed key:** (½ or 0)

3. Assume that  $NPV_A = \$689.98$  and that  $NPV_B = \$5,671.08$ . According to the NPV rule of project acceptance, we would choose Project B because it has the higher positive NPV.

**Proposed key:** (½ or 0)

4. Briefly explain what causes the difference (assuming there is one) in the decision reached by NPV and IRR. (1 mark)

**The difference in scale was ignored. Project B has a substantially larger initial investment than does project A has. Thus, the simple IRR calculation may not lead to the best decision.**

**Proposed key:** (Concept is on scale differences while analyzing mutually exclusive projects. 1 or 0)

5. Reconcile the difference (assuming there is one) in the decision between NPV and IRR. Assume an effective annual discount rate of 15%. Perform the appropriate calculations. Explain what the results indicate. Make sure to show your work. (2 marks)

Year	0	1	2
Incremental cash flows of Project B over A:	-95,000	61,500	61,500

$$NPV_{B-A} = C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2}$$

$$0 = -95,000 + \frac{61,500}{1 + IRR_{B-A}} + \frac{61,500}{(1 + IRR_{B-A})^2}$$

$$IRR_{B-A} = 19.09442\%$$

Since the incremental IRR of B over A is greater than the hurdle rate, it is indicated that the additional investment in project B is worthwhile and that it should be the project chosen.

Proposed key: (1/2 mark for incremental cash flows; 1/2 mark for equation set-up; 1/2 mark for IRR; 1/2 mark for the explanation.)

**Problem Five (14 marks)**

After extensive research and development, Goodweek Tire Inc. (GW), has recently developed a new tire, the SuperTread, and must decide whether to make the investments necessary to produce and market it. The SuperTread would be ideal for drivers doing a large amount of wet weather and off-road driving in addition to normal highway use. The research and development (R&D) costs so far total \$10,000,000. The new tire would be put on the market this year and is expected to stay on the market for a total of 4 years. Test marketing costing \$5,000,000 shows a significant market exists for the SuperTread.

GW would be required to initially invest \$120,000,000 in production equipment to make the new tires. The payment for this equipment will be 30% in cash with the remaining 70% to be borrowed from the bank. Interest costs will be \$6,000,000 per year over the life of the project. The equipment has an expected useful life of 7 years and would fall into a large pool of assets with a CCA rate of 20%. At the end of the 4<sup>th</sup> year, it will be sold for \$51,428,571. The asset pool will continue, however.

The SuperTread would be marketed to 2 separate markets:

1. Original equipment manufacturer (OEM) market: This market is made up of the large automobile manufacturers. GW expects to sell the SuperTread for \$36 per tire in the first year and incur a variable cost of \$18 per tire in the first year, and will rise with inflation thereafter.
2. Replacement market: This market allows higher margins, and GW expects to sell the SuperTread for a price of \$59 per tire in the first year, with the same variable costs as in the OEM market.

GW intends to raise its prices by 1 percent above the annual inflation rate each year. In addition, the SuperTread project will incur \$25,000,000 in marketing and general administration costs the first year (expected to increase at the inflation rate in subsequent years).

GW's corporate tax rate is 40%. Annual inflation is expected to remain constant at 3.25%. GW uses a nominal rate of 15.9% effective per year to evaluate new product decisions. All operating revenues and expenses are expected to occur at the end of each year of the project.

The Tire market: Large automobile manufacturers (OEM market) are expecting to produce 2 million new cars this year. Production is expected to grow at 2.5% per year thereafter. Each new car will need 4 new tires. GW expects to capture 11% of this market. Replacement tires needed this year are expected to be 14 million, and will grow by 2% per year thereafter. GW expects to capture 8% of this market.

GW's non-cash Net Working Capital will increase by \$11,000,000 immediately and remain at the higher levels until the end of the project, when the full amount will be recovered.

You are the financial analyst. Answer the following questions that your Chief Financial Officer has asked of you.

1. What is the present value of the net cash flows created by the CCA deductions over the life of the project? (Specify as a cash inflow or outflow) (2 marks)

$$PV_{CCA} = \frac{\$120,000,000(.20)(.40)}{(.159 + .20)} \cdot \frac{[1 + 0.5(0.159)]}{(1 + .159)} - \frac{\$51,428,571(.20)(.40)}{(1 + .159)^4} - \frac{(.159 + .20)}{(1 + .159)^4}$$

$$PV_{CCA} = \$24,906,688.84 - \$6,351,353.01$$

$$PV_{CCA} = \$18,555,335.83$$

**Proposed key: (½ off per error)**

2. What is the amount of the CCA deduction in the 3<sup>rd</sup> year assuming GW has used its full CCA deduction in each of years 1 and 2? (2 marks)

$$CCA_{Yr 1} = \$120,000,000 \times .20 \times .5 = \$12,000,000$$

$$UCC_{End Yr 1} = \$120,000,000 - \$12,000,000 = \$108,000,000$$

$$CCA_{Yr 2} = \$108,000,000 \times .20 = \$21,600,000$$

$$UCC_{End Yr 2} = \$108,000,000 - \$21,600,000 = \$86,400,000$$

$$CCA_{Yr 3} = \$86,400,000 \times .20 = \$17,280,000$$

**OR...**

$$CCA_{Yr 3} = \$120,000,000 \times \left(1 - \frac{.20}{2}\right) \times (1 - .20) \times .20 = \$17,280,000$$

**Proposed key: (1½ marks for determining year 2 ending UCC; ½ mark for determining year 3 CCA; ½ mark off per error.)**

3. Excluding CCA effects, what is the Earnings before Depreciation and Taxes for the first year of the project? (2½ marks)

**Sales**

$$OEM = \$36 \times 2,000,000 \times 4 \text{ tires} \times 0.11 = \$31,680,000$$

$$Replacement = \$59 \times 14,000,000 \times 0.08 = \$66,080,000$$

**Expenses**

$$OEM \text{ var} = \$18 \times 2,000,000 \times 4 \times 0.11 = \$15,840,000$$

$$Replacement \text{ var} = \$18 \times 14,000,000 \times 0.08 = \$20,160,000$$

$$Marketing = \$25,000,000$$

$$EBDT = \$36,760,000$$

**Proposed key: (½ mark for each calculation; ½ mark for inclusion of marketing costs.)**

4. Ignoring any calculations above assume that for GW the first year product volumes are as follows: OEM: 800,000 tires; Replacement: 1,200,000 tires. Calculate the effect on NPV of the projected OEM tire revenues. (3 marks)

$$1 + g = (1 + \pi + \text{GW's over inflation decision})(1 + \text{production growth})$$

$$1 + g = (1 + 0.0325 + 0.01)(1.025)$$

$$g = 0.06856250$$

$$PV_{\text{OEM Rev}} = \frac{C_1}{r - g} \left[ 1 - \left( \frac{1 + g}{1 + r} \right)^T \right]$$

$$PV_{\text{OEM Rev}} = \frac{(800,000)(\$36)(1 - .40)}{(.159 - .06856250)} \cdot \left\{ 1 - \left[ \frac{(1.06856250)}{1.159} \right]^4 \right\}$$

$$PV_{\text{OEM Rev}} = \$53,013,313.88$$

Proposed key: (1½ mark to calculate g; 1½ mark to set-up and solve the growing annuity; ½ off per error)

5. Calculate the amount of variable costs incurred for the Replacement market in the 4<sup>th</sup> year of the project. (3 marks)

$$\text{sales volume} = 1,200,000 \times (1.02)^3 = 1,273,449.60$$

$$\text{variable unit cost} = \$18 \times (1.0325)^3 = \$19.81265541\dots$$

$$\begin{aligned} \text{variable cost} &= \text{sales volume} \times \text{variable unit cost} \\ &= 1,273,449.60 \text{ tires} \times \$19.81265541 \\ &= \$25,230,418.10 \end{aligned}$$

Proposed key: (1 mark per calculation; ½ off per error.)

6. There may be cash flows presented in the GW case that should not be included. If there are, list them and explain very briefly why they should not be included. (1½ marks)

Interest costs (the discount rate takes care of this)

Research and Development (sunk cost)

Test marketing costs (sunk cost)

Proposed key: (½ mark or 0 for each.)

**Problem Six (3 marks)**

You were analyzing a new project's cash flows when your computer crashed before you could save all of your information. You restarted your computer and discovered the following information:

NPV of the project = \$106,235.91  
Real discount rate = 10%

Year	Project cash flows			
	0	1	2	3
Real amounts	-\$600,000	\$0	?	\$500,000
Nominal amounts	?	\$0	\$441,000	?

1. Determine the missing real cash flow at year 2. (2 marks)

$$NPV = -C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2}$$

$$\$106,235.91 = -\$600,000 + \frac{x}{(1.10)^2} + \frac{\$500,000}{(1.10)^3}$$

$$\$106,235.91 + \$600,000 - \frac{\$500,000}{(1.10)^3} = \frac{x}{(1.10)^2}$$

$$\$330,578.51 = \frac{x}{(1.10)^2}$$

$$x = \$400,000$$

**Proposed key:** (½ off per error; ½ off for missing the formula.)

2. Determine the inflation rate. (1 mark)

$$\frac{\$441,000}{\$400,000} = (1+i)^2$$

$$(1.1025)^{1/2} - 1 = i$$

$$i = .05 = 5\%$$

**Proposed key:** (½ for basic set-up; ½ for solution; or 0 each)