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ÉCOLE DE GESTION
SCHOOL OF MANAGEMENT

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ADM 2350 | Final Examination | Name: _____
December 16, 2011 | Version #1 Solutions | Student ID #: _____

Section A Prof. Rentz (Wed. 1:00 PM – 2:30 PM & Fri. 11:30 AM – 1:00 PM)
Section B Prof. Rentz (Wed. 7:00 PM – 10:00 PM)

Statement of Academic Integrity:
The 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.

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Note: An examination copy or booklet without that signed statement will not be graded and will receive a final exam grade of zero.

General Instructions:

1. Please **CIRCLE YOUR SECTION** and **SIGN** the academic integrity statement above.
2. There are **SIXTEEN** pages and **THREE** parts to this exam.
3. Please put your **Name and Student ID# on ALL SIXTEEN pages**.
4. 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.
5. The use of **scientific and financial calculators is encouraged**.
6. **Laptop computers or any other devices that can be used for communication are NOT permitted**.
7. Please **do NOT take apart the pages** of this exam.
8. You have 3 **hours** to work this exam. In order to finish this exam, **it is highly recommended that students allocate no more than 40 minutes to Part I, 80 minutes to Part II, and 30 minutes to Part III. This will permit the student to have 30 minutes to review the work.**
9. **GOOD LUCK!**

Part I: (40 minutes) There are **FOURTEEN QUESTIONS** in this part of the exam. Each question counts 1 mark. Choose the one answer that **BEST** answers each question. No credit is given for a wrong answer, an omitted answer, or more than one answer to a question.

1. _____ markets deal in short-term securities having maturities of one year or less.
   a. Credit
   b. Money
   c. Commodity futures
   d. Capital
   e. Foreign exchange
   f. Both a. and b. above.

2. The primary reason for goal of the financial manager should be to:
   a. Maximize earnings per share.
   b. Minimize losses.
   c. Provide a stable dividend payout ratio.
   d. Maximize shareholder wealth.
   e. All of the above.
   f. None of the above.

3. Regular or ordinary annuity calculations are especially important when dealing with:
   a. Term loans.
   b. Lease contracts.
   c. Insurance premiums.
   d. Mortgages.
   e. All of the above.
   f. Both a. and d. above.

4. Which of the following statements is (are) TRUE about a zero coupon bond?
   a. Is structured similar to long-term T-bill.
   b. Has a duration equal to its term to maturity.
   c. Is LESS sensitive to interest rates changes than a coupon bond with the same term to maturity.
   d. All of the above.
   e. None of the above.
   f. Both a. and b. above.

5. Which of the following is (are) workable assumption(s) for the valuation model, $P_0 = D_1/(k_e - g)$ if it is to give the total present value?
   a. Growth is **NEGATIVE**.
   b. There will be **NO** growth.
   c. The growth rate will **EXCEED** the required return.
   d. The required return is **HIGH** (30%).
   e. All of the above are workable assumptions.
   f. Answers a., b., and d. above are workable assumptions.

6. Which of the following statements is (are) TRUE concerning the arithmetic mean (AM) and geometric mean (GM)?
   a. The AM is ALWAYS greater than or equal to the GM.
   b. The GM is NEVER greater than the AM.
   c. The GM usually provides a better estimate of long-run investment performance than the AM.
   d. All of the above.
   e. None of the above.
   f. Both b. and c. above.

7. Which of the following are difficulties concerning beta and its estimation?
   a. A security or project may **NOT** have a past history as a basis for calculating beta.
   b. During a period of transition of beta, the calculated beta **MAY** be drastically different than the true beta.
   c. The firm has recently acquired another firm in a different industry.
   d. Sometimes the past data used to calculate beta do **NOT** reflect the likely risk of the firm for the future because conditions have changed.
   e. All of the above are pertinent problems.
   f. None of the above are pertinent problems.

8. The internal rate of return:
   a. May have **AT MOST ONE** positive value if a project is **NORMAL**.
   b. Is the YTM of an annual pay bond.
   c. May have **MORE THAN ONE** positive value if a project is **NON-NORMAL**.
   d. Indicates a **NORMAL** project should be accepted if its IRR is **GREATER** than the its cost of capital.
   e. All of the above are TRUE.
   f. Only a., c., and d. above are TRUE.

9. Behavioural finance states that investors:
   a. May become “snake bitten”.
   b. Are risk averse.
   c. May become tied to some initial price or perception.
   d. All of the above are correct.
   e. Both a. and b. above.
   f. Both a. and c. above.

10. Which of the following activities is (are) an example(s) of the erosion or cannibalization effect?
    a. Minto includes the impact of a new apartment building on the rents from its existing buildings.
    b. Honda Motors invests in a flexible production line to permit rapid change of model production.
    c. Goldcorp temporarily shuts down a mine because the unit variable cost exceeds the price of gold.
    d. In the NPV calculation of its Fusion project, Gillette includes the impact on its Mach 3 product.
    e. Both a. and d. above.
    f. Both b. and c. above.

11. Which of the following is (are) an example(s) of an agency cost or problem?
    a. The bonuses for factory workers are based on the profitability of the firm.
    b. During periods of financial distress, there can be a growing divergence between the interests of equity holders and debt holders.
    c. AIG sells credit default swaps on GM bonds, declares the entire premiums received as profit, and pays bonuses to executives based on this profit.
    d. Stock options are given to the chief executive officer.
    e. All of the above are examples of an agency cost or problem.
    f. Only b., c., and d. above are examples of an agency cost or problem.

12. Which of the following statement(s) about a project's cost of capital is (are) TRUE?
    a. It is the appropriate discount rate to use to calculate the NPV of a project.
    b. It is the appropriate hurdle rate to use for the IRR method for a project.
    c. It is **ALWAYS** equal to the firm's weighted average cost of capital.
    d. It is used in calculating the profitability index for a project.
    e. All of the above are TRUE.
    f. Only a., b., and d. above are TRUE.

13. Firms choose to finance current assets with short-term debt because:
    a. Matching the maturities of assets and liabilities reduces risk.
    b. Short-term interest rates have traditionally been more stable than long-term interest rates.
    c. A firm that borrows heavily long-term is more apt to be unable to repay the debt than the firm that borrows heavily short-term.
    d. The yield curve has traditionally been **UPWARD** sloping.
    e. Sales remain constant over the year, and financing requirements also remain constant.
    f. Both a. and d. above.

14. A credit manager is maximizing shareholder wealth:
    a. If the firm **NEVER** has any bad debt loss.
    b. Carefully analyzes the costs and benefits of extending credit to different risk classes of customers.
    c. Closely monitors any changes in the payment patterns of customers
    d. Both b. and c. above.
    e. All of the above.
    f. None of the above.

Part II: (80 minutes) There are **SEVEN multiple-choice problems and ONE short essay** in this part. Each question counts 2 marks for a total of 16 marks for this part. **To receive credit for each of the seven problems, you must show your work.**

15. Black Brick (BB) just paid a dividend D_0 of $1,000.00. In eight years BB expects to pay a dividend D_8 of $1,850.93. **To the nearest 1/100 of a percent (i.e. x.xx%)**, what is the compound rate of growth expected for RB's dividends?

a. 5%
b. 7%
c. 11%
d. 10%
e. 9%
f. 8%
g. None of the above is correct.

Scientific Calculator Approach:

$$\$1,000\times(1+g)^{8}=\$1,850.93\Rightarrow 1+g=\left[\frac{\$1,850.93}{\$1,000}\right]^{1/8}\Rightarrow g=0.0800\ or\ 8.00\%$$

Scientific Calculator Marking Scheme:

½ mark for correct original expression for growth rate
½ mark for correct expression solving for the growth rate
½ mark for correctly substituting into the growth rate expression
½ mark for correctly calculating the growth rate

Financial Calculator Approach:

P/Y = C/Y =1, N = 8, PV = -1,000, PMT = 0, FV = 1,850.93, CPT I/Y = 8.00

Financial Calculator Marking Scheme:

½ mark for recognizing that compound growth is equivalent to compound interest
½ mark for P/Y = C/Y = 1 and N = 8
½ mark for recognizing that PV and FV must have opposite signs
½ mark for correctly calculating the growth rate

16. What is the present value of a quarterly perpetuity if the quarterly payments of $100 occur at the **BEGINNING** of every quarter and the nominal annual interest rate is 20% with quarterly compounding.

a. $1,000.00
b. $1,100.00
c. $500.00
d. $600.00
e. $2,000.00
f. $2,100.00
g. None of the above.

PV of perpetuity = (periodic payment)/(effective periodic interest rate)

Effective periodic interest rate = 20%/4 = 5%

PV of perpetuity = $100/0.05 = $2,000

We are asked, however, to find the PV of a perpetuity due. In the case of a perpetuity we can simply add the "extra" payment.

PV of perpetuity due = PV of perpetuity + "extra" payment @ t = 0 = $2,000 + $100 = $2,100

Alternatively, one can find the PV of a perpetuity due in the same fashion as the PV of an annuity due.

PV of perpetuity due = (1 + effective periodic interest rate) x PV of perpetuity = 1.05 x $2,000 = $2,100

Marking Scheme:

½ mark for correct calculation of effective periodic interest rate
½ mark for correct calculation of PV of perpetuity
½ mark for correct formulation of PV of perpetuity due
½ mark for correct calculation of PV of perpetuity due

17. A firm borrows $10,000 under a five-year loan agreement at an interest rate of 10 percent. The repayment schedule calls for 5 annual repayments, the first occurring at the end of the first year. **To the nearest dollar**, how much of the third year payment is **interest**?

a. $2,638
b. $836
c. $1,802
d. $1,982
e. $4,578
f. $656
g. None of the above.

Scientific Calculator Approach:

Loan payment = (Amt. borrowed)/$PVIFA_{i,n}$ = $10,000/$PVIFA_{10\%,5}$ = $10,000/3.791 = $2,638

Period	Total Payment	Interest Payment	Principal Payment	Remaining Balance
				$10,000
1	$2,638	$1,000	$1,638	$ 8,362
2	$2,638	$ 836	$1,802	$ 6,560
3	$2,638	$ 656	$1,982	$ 4,578

Financial Calculator:

Set calculator in **END** mode, P/Y = C/Y = 1, N = 5, I/Y = 10%, PV = $10,000, FV = 0, and then CPT PMT = - $2,638. Then go [2nd] [Amort] to enter the amortization schedule. One can skip the first and second years by entering P1 = P2 = 3 and finding INT = -$656.

½ mark for correctly setting up the loan calculation
½ mark for correctly calculating the loan payment
½ mark for correctly setting up the loan amortization schedule
½ mark for correctly calculating the interest payment in year 3

18. Harry's Metal Works, Inc., has two bond issues outstanding. The first issue has a coupon rate of 8% and 20 years to maturity. The second has a coupon interest rate of 6.943% and 10 years to maturity. Both issues are payable annually. **To the nearest whole percent**, what yield to maturity would result in the same current price for the bonds?

HINT #1: Conceptually, the desired yield to maturity represents the crossover discount rate or Fisher rate that generates the same PV of future cash flows for the bonds.

HINT #2: If you are **NOT** using a financial calculator, the approximate YTM formula may be useful in first finding the common current price B and then finding the desired YTM.

$$YTM = \frac{\left[I + \left(\frac{(F - B)}{n} \right) \right]}{\left[\frac{(2B + F)}{3} \right]}$$

a. 13%
b. 12%
c. 11%
d. 10%
e. 9%
f. 8%
g. None of the above.

Scientific Calculator Approach:

Equate the YTM approximation formula for each bond and solve for the common current price B. Since the denominators are the same, one only needs to equate the numerators.

$$\$80 + \frac{\$1,000 - B}{20} = \$69.43 + \frac{\$1,000 - B}{10}$$
$$\$80 + \$50 - 0.05B = \$69.43 + \$100 - 0.1B$$
$$0.05B = \$39.43 \Rightarrow B = \$788.60$$

Calculate the YTM of the 20-year bond.

$$YTM = \frac{\left[I + \left(\frac{(F - B)}{n} \right) \right]}{\left[\frac{(2B + F)}{3} \right]} = \frac{\left[\$80 + \left(\frac{(\$1,000 - \$788.60)}{20} \right) \right]}{\left[\frac{(2 \times \$788.60 + \$1,000)}{3} \right]} = \frac{\$4,800 + 3 \times (\$1,000 - \$788.60)}{20 \times \$2,577.20}$$

$$YTM = \frac{\$5,434.20}{\$51,544} = 10.54\% \approx 11\%$$

ADDITIONAL SPACE PROVIDED FOR PROBLEM 18

Calculate the YTM of the 10-year bond as a check on one's previous calculations.

$$YTM = \frac{\left[I + \left(\frac{(F-B)}{n}\right)\right]}{\left[\frac{(2B+F)}{3}\right]} = \frac{\left[\$69.43 + \left(\frac{(\$1,000 - \$788.60)}{10}\right)\right]}{\left[\frac{(2\times\$788.60 + \$1,000)}{3}\right]} = \frac{\$2,082.90 + 3\times(\$1,000 - \$788.60)}{10\times\$2,577.20}$$

$$YTM = \frac{\$2,717.10}{\$25,772} = 10.54\% \approx 11\%$$

Scientific Calculator Marking Scheme:

½ mark for correctly substituting into the equated YTMs
½ mark for correctly calculating the approximate bond value
½ mark for correctly substituting into the YTM approximation formula for one of the bonds
½ mark for correctly calculating the approximate YTM

Financial Calculator Approach:

Equate the bond values.

$$\sum_{t=1}^{20}\frac{\$80}{(1+k_d)^t} + \frac{\$1,000}{(1+k_d)^{20}} = \sum_{t=1}^{10}\frac{\$69.43}{(1+k_d)^t} + \frac{\$1,000}{(1+k_d)^{10}}$$

$$\sum_{t=1}^{10}\frac{\$10.57}{(1+k_d)^t} + \sum_{t=11}^{20}\frac{\$80}{(1+k_d)^t} - \frac{\$1,000}{(1+k_d)^{10}} + \frac{\$1,000}{(1+k_d)^{20}} = 0$$

Now use the cash flow menu to find the IRR.

CF0 = 0, C01 = \$10.57, F01 = 9, C02 = \$10.57 - \$1,000 = - \$989.43, F02 = 1, C03 = \$80, F03 = 9, C04 = \$80 + \$1,000 = \$1,080, F04 = 1, IRR CPT = 11.00%.

Financial Calculator Marking Scheme:

½ mark for correctly equating the two bond values
½ mark for correctly rearranging the terms so that k_d is an IRR calculation
½ mark for correctly substituting into the cash flow registers
½ mark for correctly calculating the YTM

19. The Dwindling Reserves Oil Company (DROC) expects to pay a $144,000 per share dividend for fiscal 2012 and fiscal 2013. Then DROC expects to pay a $248,832 per share dividend for fiscal 2014, fiscal 2015, and fiscal 2016. Thereafter, dividends are expected to **DECLINE** by 20% per year. If investor's require a 20% rate of return, what is a fair market price per share **to the nearest dollar** for DROC's stock at the **BEGINNING** of fiscal 2012.

a. $497,664
b. $812,160
c. $784,000
d. $622,080
e. $746,496
f. Cannot compute this price with the information that is given.
g. None of the above.

$D_1 = D_2 = \$144{,}000$, $D_3 = D_4 = D_5 = \$248{,}832$, $D_6 = \$248{,}832 \times (1 - 0.2) = \$199{,}065.60$

$$P_5 = \frac{D_6}{k_e - g} = \frac{\$199{,}065.60}{0.20 + 0.20} = \$497{,}664$$ ½ mark for calculating P_5 or P_4 correctly

$$P_2 = \frac{D_3}{(1+k_e)^1} + \frac{D_4}{(1+k_e)^2} + \frac{(D_5 + P_5)}{(1+k_e)^3}$$

$$P_2 = \frac{\$248{,}832}{(1.20)^1} + \frac{\$248{,}832}{(1.20)^2} + \frac{(\$248{,}832 + \$497{,}664)}{(1.20)^3}$$ ½ mark for calculating P_2 correctly

$$P_2 = \$207{,}360 + \$172{,}800 + \$432{,}000 = \$812{,}160$$

$$P_0 = \frac{D_1}{(1+k_e)^1} + \frac{(D_2 + P_2)}{(1+k_e)^2}$$

$$P_0 = \frac{\$144{,}000}{(1.20)^1} + \frac{(\$144{,}000 + \$812{,}160)}{(1.20)^2}$$ ½ mark for correct formula for P_0

$$P_0 = \$120{,}000 + \$664{,}000 = \$784{,}000$$

½ mark for calculating P_0 correctly

NB. One could start the perpetual growth model with the fifth dividend instead of the sixth.

$$P_4 = \frac{D_5}{k_e - g} = \frac{\$248{,}832}{0.20 + 0.20} = \$622{,}080$$

$$P_2 = \frac{D_3}{(1+k_e)^1} + \frac{(D_4 + P_4)}{(1+k_e)^2}$$

$$P_2 = \frac{\$248{,}832}{(1.20)^1} + \frac{(\$248{,}832 + \$622{,}080)}{(1.20)^2}$$

$$P_2 = \$207{,}360 + \$604{,}800 = \$812{,}160$$

20. Riverside Furniture owns a fleet of trucks to deliver furniture to its customers. The owner of the store, Saul Steinberg, asked his accountant Harry Markowitz to estimate the cash flows from operating a truck for three, four, or five years. In Table I below are Harry's cash flow estimates. A truck costs $40,000. It will be replaced at the end of its lifetime with a new truck with identical costs, benefits, and lifetime. These estimates include (1) the savings from NOT having to pay delivery fees to independent trucking firms, (2) operating costs of the truck, (3) all CCA tax shield effects, (4) all net working capital effects, and (5) the salvage values at the end of the various lifetimes. Saul and Harry both agree that the firm's cost of capital for trucks is 8%.

Table I

Lifetime	CF_1	CF_2	CF_3	CF_4	CF_5
3 years	$20,000	$20,000	$40,000		
4 years	$20,000	$20,000	$20,000	$35,000	
5 years	$20,000	$20,000	$20,000	$20,000	$30,000

Saul has hired you as a consultant to recommend the optimal truck replacement cycle by calculating the values of the appropriate decision criterion for the various truck lifetimes.

$$NPV_{3-yr} = \frac{\$20,000}{1.08^1} + \frac{\$20,000}{1.08^2} + \frac{\$40,000}{1.08^3} - \$40,000$$

$$NPV_{3-yr} = \$18,518.52 + \$17,146.78 + \$31,753.29 - \$40,000 = \$27,418.59$$

$$EANPV_{3-yr} = \frac{\$27,418.59}{PVIFA_{8\%,3}} = \frac{\$27,418.59}{2.57709699} = \$10,639.33$$

$$NPV_{4-yr} = \frac{\$20,000}{1.08^1} + \frac{\$20,000}{1.08^2} + \frac{\$20,000}{1.08^3} + \frac{\$35,000}{1.08^4} - \$40,000$$

$$NPV_{4-yr} = \$18,518.52 + \$17,146.78 + \$15,876.64 + \$25,726.04 - \$40,000 = \$37,267.98$$

$$EANPV_{4-yr} = \frac{\$37,267.98}{PVIFA_{8\%,4}} = \frac{\$37,267.98}{3.31212684} = \$11,251.98$$

$$NPV_{5-yr} = \frac{\$20,000}{1.08^1} + \frac{\$20,000}{1.08^2} + \frac{\$20,000}{1.08^3} + \frac{\$20,000}{1.08^4} + \frac{\$30,000}{1.08^5} - \$40,000$$

$$NPV_{5-yr} = \$18,518.52 + \$17,146.78 + \$15,876.64 + \$14,700.60 + \$20,417.50 - \$40,000 = \$46,660.04$$

$$EANPV_{5-yr} = \frac{\$46,660.04}{PVIFA_{8\%,5}} = \frac{\$46,660.04}{3.99271004} = \$11,686.31$$

This is a classic replacement chain problem with 3 mutually exclusive investments that are repeatable. The NPV over a common life for each investment differs from its respective EANPV by the same scale factor $PVIFA_{k,\text{common life}}$. Thus, picking the highest EANPV means that one is picking the investment with highest NPV over a common life and hence is maximizing shareholder wealth. Thus, one should pick the 5-year replacement cycle as it has highest EANPV.

½ mark for **EACH** correct EANPV calculation (**TOTAL** 1.5 marks)
½ mark for correct conclusion **GIVEN** the EANPV calculations

ADDITIONAL SPACE PROVIDED FOR PROBLEM 20

21. Alpha Products (AP) maintains a debt to equity ratio of 1/3. To finance its capital budget for next year, the firm will sell $50 million of 12 percent debentures at par and finance the balance of its $200 million capital budget with additions to retained earnings. AP's stock has a beta of 0.6 and the expected market risk premium is 20%. Long-term Government of Canada bonds are currently yielding 4%. The firm has a marginal tax rate of 25 percent. **To the nearest 1/100 of a percent (i.e. x.xx%)**, what is AP's weighted average cost of capital for the coming year?

a. 15.00%
b. 12.45%
c. 13.20%
d. 12.07%
e. 14.25%
f. 13.67%
g. None of the above.

$$\frac{D}{S} = \frac{1}{3} \rightarrow D = \frac{S}{3} \rightarrow \frac{D}{V} = \frac{D}{D+S} = \frac{\frac{S}{3}}{\frac{S}{3}+S} = \frac{1}{4} \rightarrow \frac{S}{V} = \frac{3}{4}$$

$$k_i = k_d\left(1-T\right) = 12\%\left(1-0.25\right) = 9\%$$

$$k_e = r_f + \beta\left(k_M - r_f\right) = 4\% + \left(0.6\right)\left(20\%\right) = 4\% + 12\% = 16\%$$

$$k_a = \left(\frac{D}{V}\right)k_i + \left(\frac{S}{V}\right)k_{ne} = \left(\frac{1}{4}\right)\left(9\%\right) + \left(\frac{3}{4}\right)\left(16\%\right) = 2.25\% + 12\% = 14.25\%$$

Marking Scheme provided student obtained result making the indicated mistake(s):

1 mark credit for answer a. Used k_d instead of k_i.
1 mark credit for answer b. Confusion of market risk premium with required market return.
0 marks credit for answer c. Confusion about market risk premium and used k_d instead of k_i.
0 marks credit for answer d. Confusion about market risk premium and used wrong weights.
2 marks credit for answer e. Full credit provided student made no offsetting errors.
1 mark credit for answer f. Used wrong weights.
At most 1 marks for answer g. depending on the nature of a student's mistake(s).

22. Dilbert's Electronics is considering offering credit terms to class of customers that is expected to have bad debt losses of 14%. If this class of customers is accepted, the average collection period for this class will be 36.5 days. The additional collection expenses will be $30,000, and the firm will need to make an additional investment in receivables of $100,000. The firm's variable cost percentage is 60%, and any funds invested in additional receivables and additional inventories cost the firm a pre-tax interest rate of 10%. **To the nearest ten thousand dollars,** what is the minimum sales level to these customers so that the firm breaks even by extending credit to this class?

a. $100,000
b. $120,000
c. $140,000
d. $160,000
e. $180,000
f. Cannot determine from the information provided.
g. None of the above.

ΔSales – ΔVariable costs – ΔBad debts – ΔCollect. expenses – ΔRec. carry costs – ΔInv. carry costs = 0

$\Delta S - 0.60\Delta S - 0.14\Delta S - \$30{,}000 - 0.10 \times 36.5 \text{ days} \times (\Delta S/365\text{days}) - 0.10 \times \$100{,}000 = 0$

$0.25\Delta S = \$40{,}000 \rightarrow \Delta S = \$160{,}000$

$160,000	Additional sales
$ 96,000	Additional variable costs
$ 64,000	Additional profits before credit costs & taxes
$ 22,400	Additional bad debt losses
$ 30,000	Additional collection expenses
$ 1,600	Additional receivables carrying costs
$ 10,000	Additional inventory carrying costs
$ 64,000	Additional credit costs

Marking Scheme:

1 mark for correct formulation
1 mark for correct solution based on correct formulation

Alternatively, a student may try different sales values using net income statements. So long as the statements are done correctly, the student may earn full marks if the student obtains the breakeven sales level. 1 mark may be awarded if the student develops trial statements correctly but never tries $160,000.

Part III: (½ hour) There is **ONE multiple-choice problem** in this part of the exam. This problem counts 10 marks. **To receive credit for this problem, you must show your work.**

23. B&C, Inc., is considering the purchase of a new data processing equipment that will **REDUCE** manufacturing costs by $10,000 annually **BEFORE** taxes. The new machine will also allow B&C to expand output and generate another $20,000 annually **BEFORE** taxes. The new equipment will be in CCA Class 50 with a CCA rate of 55%. The firm expects to sell the equipment at the end of its 4-year life for $20,000. **Although no new equipment in the same CCA class will be bought at that time, the asset class will remain open.** The firm needs to **INCREASE** net working capital by $15,000 when the equipment is installed. However, this net working capital will be **RELEASED** at the end of the equipment's economic life. The firm's marginal tax rate is 40% and it uses a 12% cost of capital to evaluate projects of this nature. If the equipment costs $80,000 what is the NPV of the project **to the nearest ten dollars**?

a. $54,670
b. $2,600
c. $12,710
d. $24,860
e. - $4,170
f. $9,530
g. None of the above.

CCA Formula Method:

Step 1: PV of After-Tax Net Cash Revenues = $30,000 x (1 – 0.4) x $PVIFA_{12\%,4}$ = $54,672

Step 2A: PV of CCA Tax Shields from initial capital cost = $\left[\frac{1.06}{1.12}\right]\left[\frac{(.4)(.55)(\$80,000)}{(0.12+0.55)}\right] = \$24,861$

Step 2B: PV of Tax Shields Lost Due to Salvage Value = $-\left[\frac{1}{1.12^4}\right]\left[\frac{(.4)(.55)(\$20,000)}{(0.12+0.55)}\right] = -\$4,174$

NB. Combined Step 2A and Step 2B = $20,687

Step 3: PV of Salvage Value = $\frac{\$20,000}{1.12^4} = \$12,710$

Step 4: PV of NWC effects years 1-4 = $\left[\frac{\$15,000}{1.12^4}\right] = \$9,533$

NB. Combined Steps 3 and 4 = $22,243

Step 5: - Initial Outlay = - ($80,000 + $15,000) = - $95,000

NPV = $54,672 + $20,687 + $12,710 + $9,533 - $95,000 = $2,602

ADDITIONAL SPACE PROVIDED FOR PROBLEM 23

Cash Flow Analysis Method:

Initial Outlay = Initial Capital Cost + Increase in NWC = $20,000 - $15,000 = $5,000

Year	Starting UCC	CCA	CCA Tax Shields	Ending UCC
1	$80,000	$22,000*	$ 8,800	$58,000
2	$58,000	$31,900	$12,760	$26,100
3	$26,100	$14,335	$ 5,742	$11,745
4	$11,745	$ 6,460	$ 2,584	$ 5,285

*1/2 year convention applies in first year.

	Cash In Yr. 1	Cash In Yr. 2	Cash In Yr. 3	Cash In Yr. 4
A-T Net Cash Revenues	$18,000	$18,000	$18,000	$18,000
CCA Tax Shields	$ 8,800	$12,760	$ 5,742	$ 2,584
NWC Effects	$ 0	$ 0	$ 0	$15,000
Salvage Value	$ 0	$ 0	$ 0	$20,000
PV of SV CCA effects	$ 0	$ 0	$ 0	-$ 4,832
Total	$26,800	$30,760	$23,742	$50,752

$$** \frac{Td\left(UCC_n - S_n\right)}{\left(k+d\right)} = \frac{0.40 \times 0.55 \times \left(\$5,285 - \$20,000\right)}{\left(0.12+0.55\right)} = -\$4,832$$

$$NPV = \frac{\$26,800}{1.12^1} + \frac{\$30,760}{1.12^2} + \frac{\$23,742}{1.12^3} + \frac{\$50,752}{1.12^4} - \$95,000$$

$$NPV = \$23,929 + \$24,522 + \$16,899 + \$32,254 - \$95,000 = \$2,604$$

Marking Scheme:

1 mark for correct after-tax net cash revenues calculation of $18,000
1 mark for correct Step 1 PV of A-T net cash revenues or correctly entering Yrs. 1-4 values
1 mark for correct CCA tax effects from initial capital cost (Step 2A or Yrs. 1–4 in table)
1 mark for correct CCA tax effects due to salvage value (Step 2B or -$4,832 table calculation)
1 mark for correct Step 3 PV of salvage value or correctly entering Yr. 4 table salvage value
1 mark for correct sign of NWC effects in Yr. 4
1 mark for correct Step 4 PV of NWC effects or correctly entering Yrs. 1 – 4 table values
1 mark for correct initial outlay of $95,000
1 mark for correct NPV value **GIVEN** previous errors
1 mark for everything correct