École de gestion
TELFER
School of Management

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Quiz #2 Examination
Version #1 Solutions

Name: _____
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 quiz 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, tablets, 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!

Part I - Multiple Choice Questions (4 Marks)

There are four multiple-choice questions in this part. Each question counts 1 mark. Circle the **ONE** answer that is the **BEST** answer to each question. No credit is given for (a) no answer, (b) more than one answer, or (c) an answer other than the best answer to a question.

1. Sam Malone is Vice President and Chief Technology Officer of Cheers Software, located in Boston. Sam has just told his best buddy Clark Kent, Chief Investment Officer of Super Performance Hedge Fund, about a forthcoming Action Game called Kryptonite that will likely set record sales. Clark has his Super Performance Hedge Fund buy shares of Cheers Software, and Super Performance makes a $200 million profit on its Cheers shares immediately after Cheers announces Kryptonite.

   a. This **CONTRADICTS** the **Semi-Strong** Form of the Efficient Markets Hypothesis.
   b. This **CONTRADICTS** the **Weak** Form of the Efficient Markets Hypothesis.
   c. This does **NOT CONTRADICT** the **Semi-Strong** Form of the Efficient Markets Hypothesis.
   d. This does **NOT CONTRADICT** the **Weak** Form of the Efficient Markets Hypothesis.
   e. Both a. and d. are **TRUE**.
   f. Both b. and c. are **TRUE**.
   g. Both a. and b. are **TRUE**.
   h. Both c. and d. are TRUE.

2. Multiple positive internal rates of return may occur when there is (are):

   a. An initial outlay of more than $1 billion.
   b. Large abandonment costs at the end of a project's life.
   c. A major shutdown and rebuilding of a facility sometime during its life.
   d. All of the above are correct.
   e. Both a. and b. above.
   f. Both a. and c. above.
   g. Both b. and c. above.

3. A firm is considering undertaking an investment project. What costs should **NOT** be included in the project's NPV calculation?

a. Reduction due to the project on the revenues net of operating costs of the firm's existing projects.
b. Current book value of a previously acquired asset.
c. Cost of a pilot project undertaken before the investment decision for this project is made.
d. Opportunity cost of a previously acquired asset used in the investment project.
e. Both a. and c. above.
f. Both b. and c. above.
g. Both a. and d. above.
h. Both c. and d. above.

4. Which of the following statements is (are) **FALSE**?

a. The investment opportunity schedule is **UPWARD** sloping to the right.
b. The investment opportunity schedule is **DOWNWARD** sloping to the right.
c. The marginal cost of capital schedule is **UPWARD** sloping to the right.
d. The marginal cost of capital schedule is **DOWNWARD** sloping to the right.
e. Both a. and d. above.
f. Both b. and c. above.
g. None of the above.

Part II - Multiple Choice Problems (6 Marks)

There are three multiple-choice problems in this part. Each problem is worth 2 marks. ***To receive credit, you must show your work*.** Each problem is on a separate page and an additional blank work page is provided for each problem. If you are using a financial calculator, **show what you are entering into the financial registers and show significant keystrokes.** Please also **specify the brand and model number**.

5. CKR Consultants is purchasing $300 million in equipment to expand operations to every major city in Canada. This equipment will be placed in CCA class 10 with a 30 percent CCA rate. The firm's marginal income tax rate is 25 percent. This equipment will generate revenues of $150 million per year for five years with yearly operating costs of $50 million. The estimated salvage value of the equipment in 5 years is zero. What is the NPV of this investment if CKR uses a 12 percent discount rate to evaluate investments of this type?

a. $75,000,000
b. $11,250,000
c. $19,125,000
d. $13,387,500
e. $9,371,250
f. $50,701,531
g. $21,059,746
h. $270,358,215
i. $6,559,875
j. $10,933,125
k. None of the above

CCA Formula Method:

Step 1: PV of after-tax net cash revenues

$$\sum_{t=1}^{n} \frac{CFBT_t(1-T)}{(1+k)^t} = (\$150M - \$50M)(1-0.25)PVIFA_{12\%,5} = \$270,358,215$$

Step 2A: PV of tax shields from incremental depreciable base

$$\left[\frac{1+0.5k}{1+k}\right]\left[\frac{TdC_0}{k+d}\right] = \left[\frac{1.06}{1.12}\right]\left[\frac{0.25\times 0.30\times \$300M}{0.12+0.30}\right] = \$50,701,531$$

Step 5: Subtract the initial outlay = -$300,000,000

NPV = Sum of above results = $21,059,746

Marking Scheme for CCA Formula Method:

½ mark for correct after-tax net cash revenues of $75,000,000*
½ mark for correct PV of after-tax net cash revenues of $270,358,215
½ mark for correct PV of CCA tax shields of $50,701,531
½ mark for correct NPV of $21,059,746 provided everything else is correct
*$75M need not be explicitly stated so long as PV of after-tax net cash revenues is correct

ADDITIONAL SPACE IS PROVIDED FOR WORKING PROBLEM 5

Cash Flow Analysis Method:

Single-Year Inputs						
New asset price	$300,000,000					
Ship. & install.						
Old salvage, t=0						
Life, n ≤ 20	5					
Discount rate	12.00%					
Tax rate	25.00%					
CCA rate	30.00%					
New salvage, t=n						
Old salvage, t=n						
Multi-Year Inputs						
Year	0	1	2	3	4	5
ΔNWC						
New revenues		$150,000,000	$150,000,000	$150,000,000	$150,000,000	$150,000,000
Old revenues						
New oper. costs		$50,000,000	$50,000,000	$50,000,000	$50,000,000	$50,000,000
Old oper. costs						
Intermediate Outputs						
Net capital cost	$300,000,000					
ΔSalvage, t=n	$0					
Year	0	1	2	3	4	5
Starting UCC	$0	$300,000,000	$255,000,000	$178,500,000	$124,950,000	$87,465,000
CCA	$0	$45,000,000	$76,500,000	$53,550,000	$37,485,000	$26,239,500
Ending UCC	$0	$255,000,000	$178,500,000	$124,950,000	$87,465,000	$61,225,500
ΔRevenues	$0	$150,000,000	$150,000,000	$150,000,000	$150,000,000	$150,000,000
ΔOperating costs	$0	$50,000,000	$50,000,000	$50,000,000	$50,000,000	$50,000,000
ΔNet revenues	$0	$100,000,000	$100,000,000	$100,000,000	$100,000,000	$100,000,000
Cash-Flow Outputs						
Year	0	1	2	3	4	5
Net capital cost	$300,000,000	$0	$0	$0	$0	$0
A-T Δnet revenues	$0	$75,000,000	$75,000,000	$75,000,000	$75,000,000	$75,000,000
CCA tax shield t≤n	$0	$11,250,000	$19,125,000	$13,387,500	$9,371,250	$6,559,875
ΔNWC	$0	$0	$0	$0	$0	$0
ΔSalvage, t=n	$0	$0	$0	$0	$0	$0
PV tax shield t>n	$0	$0	$0	$0	$0	$10,933,125
Net cash inflow	-$300,000,000	$86,250,000	$94,125,000	$88,387,500	$84,371,250	$92,493,000
Net present value	$21,059,746					

Marking Scheme for Cash Flow Analysis Method:

½ mark for correct after-tax net cash revenues of $75,000,000
½ mark for correct CCA tax shields for years 1-5 and PV @ t = 5 of remaining tax shields
½ mark for correct net cash inflows for years 0-5
½ mark for correct NPV of $21,059,746 provided everything else is correct

6. Len's Hardware is a chain of stores in Eastern Ontario catering to the do it yourselfers. The firm's depreciation-generated funds were $200,000 for fiscal 2011 and its additions to retained earnings were $300,000. The firm has 1,000 bonds outstanding, and **EACH** bond has a market value of $980. Len's has 10,000 shares outstanding at a price of $294 per share. Len's expects to pay a dividend of $29.40 per share for fiscal 2012, and dividends have been growing at 6 percent per year. Len's has been offered a 10 percent interest-only term loan for 15 years from the Hospitable Insurance Company (HIC), assuming that Len's maintains its current debt-to-equity ratio. The firm's marginal income tax rate is 20 percent. How much can the firm invest before it needs to raise external equity if it maintains its current debt-to-equity ratio, and what is the firm's weighted average cost of capital?

a. $300,000, 10%
b. $300,000, 14%
c. $400,000, 10%
d. $400,000, 14%
e. $500,000, 10%
f. $500,000, 14%
g. $600,000, 10%
h. $600,000, 14%
i. None of the above

Total market value of debt = $980/bond x 1,000 bonds = $980,000
Total market value of stock = $294/share x 10,000 shares = $2,940,000
Total market value of firm = $980,000 + $2,940,000 = $3,920,000

D/V = $980,000/$3,920,000 = 0.25 & S/V = 1 – D/V = 0.75

$$k_i = k_d(1-T) = 10\%(1-0.20) = 8\%$$

$$k_e = \frac{D_1}{P_0} + g = \frac{\$29.40}{\$294} + 0.06 = 0.10 + 0.06 = 0.16 \; or \; 16\%$$

$$k_a = k_e \frac{S}{V} + k_i \frac{D}{V} = (16\%)(0.75) + (8\%)(0.25) = 12\% + 2\% = 14\%$$

Equity breakpoint = depreciation + (Add. to R/E)/(S/V) = $200,000 + $300,000/0.75

Equity breakpoint = $200,000 + $400,000 = $600,000

½ mark for correct weights D/V = 0.25 and S/V = 0.75
½ mark for correct k_i = 8%, either explicitly shown or implied as part of k_a, and correct k_e = 16%
½ mark for correct k_a = 14% provided all previous steps are correct
½ mark for correct equity breakpoint of $600,000 provided all steps are correctly shown

ADDITIONAL SPACE IS PROVIDED FOR WORKING PROBLEM 6

7. Action Software is a newly formed firm that plans to make action games for the new iPad. It needs to invest in a high-powered computer server to link its different programmers. A type S server will last for 3 years, cost $40,000, and will generate after-tax cash flows of $25,000 per year. It can be replaced with an identical machine every 3 years that also will cost $40,000 and will generate after-tax cash flows of $25,000 per year. Alternatively, Action can invest in a type L server that will last 6 years, cost $70,000, and will also generate after-tax cash flows of $25,000 per year. It can be replaced with an identical machine every 6 years that also will cost $70,000 and will generate after-tax cash flows of $25,000 per year. Which of these 2 mutually exclusive alternatives should Action pursue if the cost of capital for a server is 10 percent and the firm plans to replace the selected server with an identical server as required?

   a. The firm is indifferent, as each server type has the same PV of after-tax cash flows over 6 years.
   b. Invest in type L because its NPV is $38,881.52, whereas type S has an NPV of $22,171.30.
   c. Invest in type L because over 6 years its net present investment cost is $70,000, which is $52.59 cheaper than the net present investment cost of one type S purchased at t = 0 and another at t = 3.
   d. Invest in type S because its payback period is 1.60, whereas type L has a PB of 2.80.
   e. Invest in type S because its profitability index is 1.80, whereas the type L has a PI of 1.56.
   f. Invest in type S because its IRR is 39.45 percent, whereas the type L has an IRR of 27.34 percent
   g. Invest in type S because its discounted payback period is 1.84, whereas type L has a DPB of 3.46.
   h. None of the above.

   This is a classic chain replication problem. If the replacement links in the chain are identical, one may calculate the NPV of each project using a common life or study period or one may calculate the equivalent annual annuity (sometimes called the equivalent annual net present value) of each project. For these particular projects, the common life approach is unusually trivial. First, note that 2 type S servers span the life of 1 type L for a common life of 6 years. Second, note that the after-tax cash flows are the same for either approach. Thus, one only needs to compare the net present investment cost over the common life to see which approach is cheaper. The net present investment cost of type L is simply the initial cost of $70,000. The net present investment cost of type S is the initial cost of $40,000 plus the PV of the initial cost of the second type S server, which is installed at time t = 3.

   Net present investment cost of type S = $40,000 + $40,000/$1.10^3$ = $40,000 + $30,052.59 = $70,052.59

   Since the net present investment cost of type L is $52.59 cheaper, install the type L server.

ADDITIONAL SPACE IS PROVIDED FOR WORKING PROBLEM 7