ECON 180 Summer 2018: Final Exam

June 28th, 2018 | 2:30 – 4:20 (110 minutes) | 20 pages

Material allowed: Non-programmable, non-communicating, non-financial calculator; ruler.

Any other electronic devices are to be turned off and set aside for the duration.

Answers and work are to be written on the quiz itself. You must show your work. The final pages of the quiz are reserved for **scratch paper**. The very last page of the quiz is a formula sheet. You may detach and keep the formula sheet. There are 84 marks to be earned, but the maximum mark is 80/80 = 100%.

NAME	
STUDENT #	

HONOR CODE (REQUIRED): In accordance with UVic's Policy on Academic Integrity, I certify that the answers to these questions are entirely my own work.

Signature: _____

Question		Marks	Out of
1	a		8
	b		2
	c		2
2	a		2
	b		1
	c		3
	d		3
	e		3
3	a		6
4	a		4
	b		4
	c		4
5	a		2
	b		4
6	a		4
	b		4
	c		4
7	a		6
	b		6
8	a		9
	b		3
Total			80

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1. The table below details Stampede Inc.'s purchases and dispositions of data network infrastructure equipment.

- Data network infrastructure equipment is in CCA class 10, with a CCA rate of **d = 30%**.
- **The remaining UCC balance at the end of 2013 was $10,000**.
- Stampede Inc.'s corporate income tax rate is **t = 12%**.
- Stampede Inc.'s taxable income is always over a million dollars a year.

a. (8 marks) Fill out the blanks in the table.

Year	Purchases	Dispositions	Base UCC Amount for Capital Cost Allowance	Capital Cost Allowance	Remaining UCC
2014	$ 1,121	$ 8,162	2,959	887.70	2,071.30
2015	$ 7,896	$ -	6,019.30	1,805.79	8,161.61
2016	$ 5,730	$ 3,200	9,426.51	2,827.95	7,863.56
2017	$ -	$ 1,280	6,583.56	1,975.07	4,608.49

Work:

Let P = Purchases, D = Dispositions.

2014: (P – D) = 1,121 – 8,162 = -7,041
Base UCC for CCA = 10,000 – 7,041 = 2,959
CCA = 0.3 x 2,959 = 887.70
Remaining UCC = 10,000 – 7,041 – 887.70 = 2,071.30

2015: (P – D) = 7,896
Base UCC for CCA = 2,071.30 + 7,896/2 = 6,019.30
CCA = 0.3 x 6,019.30 = 1,805.79
Remaining UCC = 2,071.30 + 7,896 – 1,805.79 = 8,161.61

2016: (P – D) = 5,730 – 3,200 = 2,530
Base UCC for CCA = 8,161.61 + 2,530/2 = 9,426.51
CCA = 0.3 x 9,426.51 = 2,827.95
Remaining UCC = 8,161.61 + 2,530 – 2,827.95 = 7,863.56

2017: (P – D) = – 1,280
Base UCC for CCA = 7,863.56 – 1,280 = 6,583.56
CCA = 0.3 x 6,583.56 = 1,975.07
Remaining UCC = 7,863.56 – 1,280 – 1,975.07 = 4,608.49

b. (2 marks) Suppose the company sold off its last asset in this class in 2017. Was there terminal loss or recapture? Explain briefly.

Terminal Loss / Recapture : _____ Terminal Loss _____

Explanation:

2017 Remaining UCC > 0

c. (2 marks) What were the savings or added costs to the company from the terminal loss or recapture in part b.? Show your work. (Note: For this answer, ignore the time value of money.)

Savings or Added Cost: $ _____553.02_____

Work:

Terminal Loss = 4,608.49
Tax benefits = t x 4,608.49 = 0.12 x 4,608.49 = 553.02

2. This question consists of brief, unrelated problems that check your knowledge of financial accounting.

a. (2 marks) An unexpected fire destroys a firm's tool-shed, leading to expenses of $1,000. Should these be reported in the firm's Operating Income, Net Income, both or neither? Explain briefly.

Operating Income, Net Income, Both or Neither? _____ Net Income _____

Explanation:

Operating Income measures income from ordinary operations. Extraordinary events must be reported as part of net income. (Any reasonable explanation should get the mark.)

b. (1 mark) Which firm is more likely to be able to deal with a large, unexpected expense that must be paid immediately: Firm A, with a quick ratio of 0.8 and a current ratio of 1.2, or Firm B, with a quick ratio of 0.1 and a current ratio of 2.7? Assume both firms have the same total assets.

Firm A or Firm B? _____A_____

Brief Explanation (Optional):

Roughly, the quick ratio measures the ability for a firm to come up with cash on VERY short notice. The current ratio is the ability to come up with cash within a year.

c. (3 marks) A firm returns defective computer equipment worth $1,000 to the manufacturer. The manufacturer pays for shipping and gives them a $1,000 cash refund. What happens to the firm's assets, liabilities and equity?

Assets:

Lost $1,000 of computer equipment, gained $1,000 in cash → Net change = $0

Liabilities:

No change.

Equity:

No change.

d. (3 marks) An engineering firm buys a crane for $75,000. It borrows $25,000, and pays for the other $50,000 out of its profits. What happens to the store's assets, liabilities and equity?

Assets:

+$75,000 Crane

Liabilities:

+$25,000 debt

Equity:

+$50,000 retained earnings

3. (3 marks) A catering company sends a bill for $1,250 to its most recent client. What happens to its assets, liabilities and equity?

Assets:

+$1,250 Accounts Receivable

Liabilities:

No change.

Equity:

+$1,250 (since none of the accounts receivable is due creditors)

3. Consider the following abbreviated Work Breakdown Structure.

Task ID	WBS Code	Duration	Predecessors
A	**1**		
B	1.1	1	-
C	**1.2**		
D	1.2.1	2	B,F
E	1.2.2	3	B
F	1.3	4	-

a. (6 marks) Draw a Gantt diagram for it on the grid provided. To make answering easier, you only need to use one colour for shading.

0	1	2	3	4	5	6	7	8	9	10
Task A										
Task B										
Task C										
Task D										
Task E										
Task F										

If you prefer not to use the grid, you may draw your own diagram in the space below.

0	1	2	3	4	5	6	7	8	9	10
Task A										
Task B										
Task C										
Task D										
Task E										
Task F										

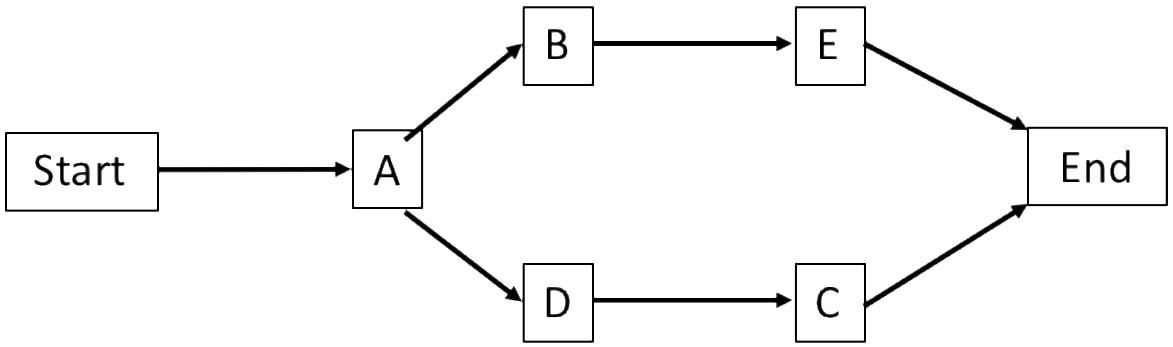
Extra colours aren't needed for full marks.

4. Consider the following project.

		Time (days)		Cost ($)	
Activity	Predecessors	Normal	Crashed	Normal	Crashed
A	-	4	3	$545,000	$630,000
B	A	5	4	$275,000	$360,000
C	D	4	1	$725,000	$790,000
D	A	5	3	$900,000	$1,305,000
E	B	5	**3**	$450,000	$590,000

In the table above, 'Normal' and 'Crashed' duration and cost mean exactly the same things they meant in the required readings in the textbook.

a. (4 marks) Draw an Activity-on-Node network diagram for the project. Label your nodes.



b. (4 marks) What are the critical tasks of the project? What is the project's duration? (Calculate these for the 'Normal' project, before any crashing.)

Critical Tasks: _____A,B,E_____

Project Duration: _____14_____

Work:

The student can either go through the whole EF/LF two-pass system, or intuitively see from the diagram that there are two paths through the network: ABE, length 14, and ADC, length 13, and therefore ABE is critical.

c. (4 marks) How much would it cost to reduce the project's duration by 2 days, compared to the normal duration you found in part b.? By how much would you have to crash each task? Show your work.

Additional project cost due to crashing: $ _____155,000_____

Task	Crash By	
A	1	days
B		days
C		days
D		days
E	1	days

	Available	Cost/Day
A	1	$ 85,000
B	1	$ 85,000
C	1	$ 65,000
D	3	$ 135,000
E	2	$ 70,000

Start by crashing A, B or E. E is cheapest, so crash by 1.
Now both paths and all nodes are critical, and project has length 13.
Need to crash either A (on both paths) or cheapest of (B,E) + cheapest of (D,C) = E + C.
A costs 85, E + C costs 70 + 65 = 135, so crash A by 1 for 85.
Additional cost = 70 + 85 = 155,000.

5. A project has cash flows as in the table below. There is **no inflation**. Your **MARR is 35% per year**.

Year	Cash Flow
0	-20
1	10
2	10
3	10
4	10
5	10
6	10
7	10
8	10
9	10
10	10

a. (2 marks) Calculate the payback period for this project, to the nearest whole year. Show your work. (Yes, this is a very simple question.)

Payback Period: _____2_____ years

Work:

2 x 10 = 20

b. (4 marks) Calculate the discounted payback period for this project, to the nearest whole year. Show your work.

Discounted Payback Period: _____4_____ years (I'll also accept 5 years, if work is correct.)

Work:

$10/1.35 + 10/1.35^2 + 10/1.35^3 + 10/1.35^4 = -0.03$
$-0.03 + 10/1.08^5 = 2.20$

6. **It is currently Year 0**. There is **no inflation**. Your **MARR is 10% per year**.

All parts of question 6 refer to the following two mutually exclusive projects:

	Cash Flows	
Year	Project A	Project B
0	-200	-100
1		500
2	2000	

a. (4 marks) Use incremental Benefit-Cost Ratio analysis and discounting to determine the preferred project. Show your work and fill in the blanks below.

Incremental Benefit-Cost Ratio (IBCR): _____11.98_____

Preferred Project: _____A_____

Work:

PV of Project A costs: 200
PV of Project A benefits: $2000/1.1^2 = 1652.89$

PV of Project B costs: 100
PV of Project B benefits: $500/1.1 = 454.55$

Incremental Benefits: $1652.89 – 454.55 = 1,198.35$
Incremental Costs: $200 – 100 = 100$

IBCR = $1,198.35/100 = 11.98 > 1$, so Project A is preferred.

b. (4 marks) Use repeated lifetimes, present worth analysis to determine the preferred project. Show your work and fill in the blanks below.

Repeated Lifetimes Present Worth of Project A: $ ____1,452.89_____

Repeated Lifetimes Present Worth of Project B: $ _____676.86_____

Preferred Project: _____A_____

Work:

Project B needs to be repeated.

One time around NPV for Project B: -100 + 500/1.1 = 354.55
Plus one year later: 354.55 + 354.55/1.1 = 676.86

Project A NPV: $-200 + 2000/1.1^2 = 1{,}452.89$

Since 1,452.89 > 676.86, Project A is preferred.

b. (4 marks) Use annual worth analysis to determine the preferred project. Show your work and fill in the blanks below.

Annual Worth of Project A: $ _____837.14_____

Annual Worth of Project B: $ _____390.00_____

Preferred Project: _____

Work:

Building on the above,

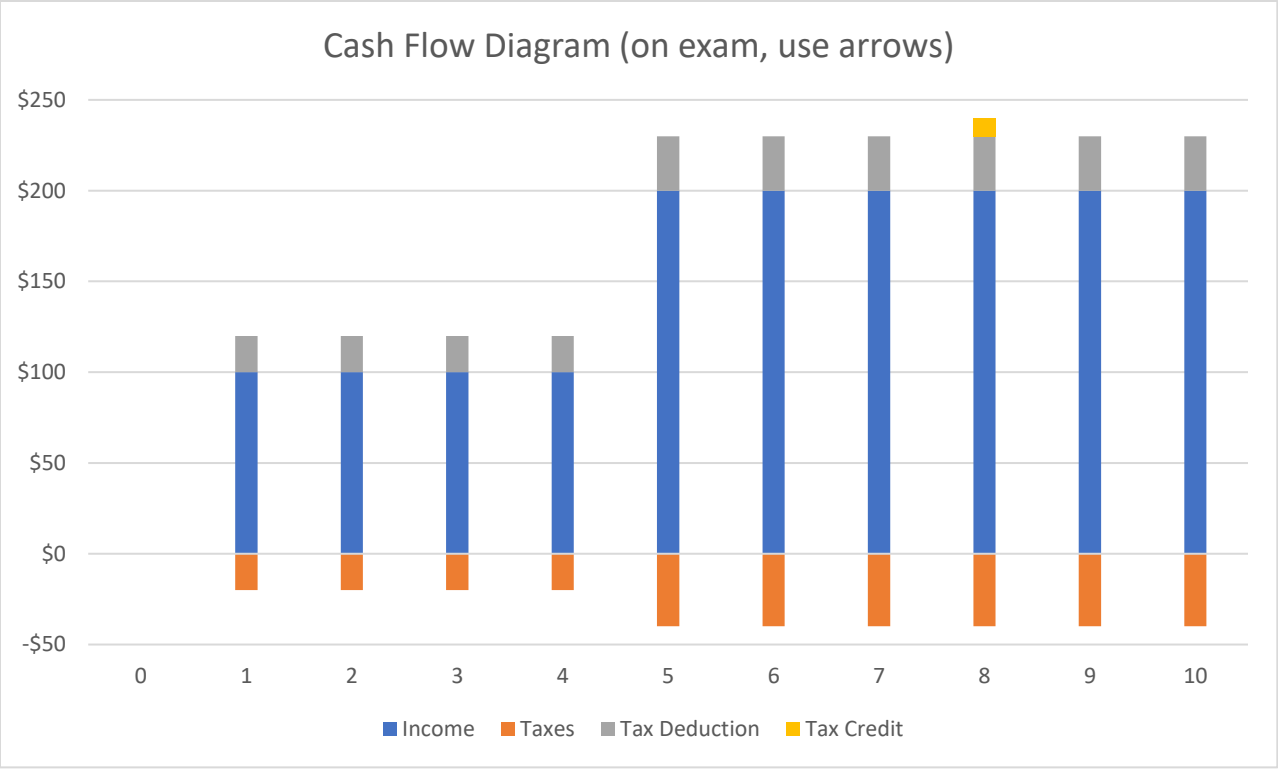
AW A = 1,452.89 x (A/P,10%,2) = 837.14
AW B = 676.86 x (A/P,10%,1) = 390.000

Since A has the higher annual worth, it's preferred.

7. Sally is thinking of starting a consulting business that will provide income from year 1 to Year 10.

- It is **currently Year 0**.
- There is **no inflation**.
- There are **no initial costs**.
- The business has **no salvage value**.
- Sally's **after-tax MARR is 10%**. The business's marginal tax rate is **t = 20%**.
- After subtracting operating costs, but before taxes, **the business will provide income of $100 a year every year from Year 1 to Year 4, and $200 a year every year from Year 5 to Year 10**.
- Sally receives a **$150 tax deduction every year from Year 1 to Year 10**. Deductions cannot be carried over from year to year. They **must be used the year they are given**.
- Sally also receives a **one-time, non-refundable tax credit of $10 in Year 8**.

a. (6 marks) Draw a cash flow diagram for Sally's business. The arrows representing the tax deductions and tax credits should be labeled with the amount of money they actually save Sally's business.



b. (6 marks) Calculate the after-tax present worth of Sally's business. Show your work.

After tax present worth: $_____886.84_____

Work:

The maximum dollar value of the tax deduction is 20% x $100 = $20.

The tax deduction eliminates tax from Year 1 to 4, and leaves $10 of tax payable in years 5 to 10. That means we have after-tax income of $100 from years 1 to 4, and $190 from years 5 to 10, plus the tax credit in Year 8.

In Year 8, the tax deduction is worth $10 of lower tax, bringing tax payable to zero.

PV of Years 1 to 4:

$100 x (P/A,10%,4) = $316.99

PV of Years 1 to 8, net of tax credit:

$190 x (P/A,10%,6) x (P/F,10%,4) = $565.19

PV of tax credit:

$10 x (P/F,10%,8) = $4.67

Total: $316.99 + $565.19 + $4.67 = $886.84

8. Consider the following situation:

- It is **currently Year 0**.
- Your firm's **real MARR is 0% (zero percent)**.
- An investment provides **nominal** income of $1,000 in Year 1, after which it goes up by 10% a year. (i.e. **a geometric gradient with an initial cost of A = $1,000, and g = 10%**).
- The **last income payment arrives in year 20**.
- **Inflation is -5% a year (deflation) from Year 0 to Year 10**.
- **Inflation is 0% a year (no inflation) from Year 10 to Year 20**.
- (This means prices are 5% lower in Year 10 than in Year 9, but prices are the same in Year 11 as they were in Year 10.)

a. (9 marks) **Assuming Year 0 is the base year** for the purpose of inflation calculations, **calculate the present worth of this investment**. Show your work.

Present Worth (Year 0 is the Base Year): $ _____91,254.79_____

We can split this into two geometric gradients: one that is positive from Year 1 to Year 10, and a second that is positive from Year 11 to Year 20. Both have N = 10, both have g = 10%, both are nominal cash flows. The main difference (apart from timing) is that A = $1,000 for the first, but $1,000 x $(1 + 10\%)^{10}$ = $2,593.74 for the second. (Since in Year 11, we've seen 10 years of growth.)

The real MARR is 0%, so the nominal MARR is (1 + 0%) x (1 – 5%) – 1 = -5%.
The growth-adjusted nominal interest rate io is (1 – 5%)/(1 + 10%) – 1 = -13.64%

PV of the first gradient is $1,000 x (P/A,-13.64%,10)/(1 + 10%) = $22,213.49

Year 10 worth of the second gradient is $2,593.74 x (P/A,-13.64%,10)/(1 + 10%) = $41,337.57

Bringing it to Year 0, we have $41,337.57 x (P/F,-5%,10) = $41,337.57/$(1 – 5\%)^{10}$ = $69,041.30

Total PW of gradient = $22,213.49 + $69,041.30 = $91,254.79

b. (3 marks) **Assuming Year 1 is the base year** for the purpose of inflation calculations, **calculate the real present worth of this investment**. Show your work and briefly explain your reasoning.

(*Hint: Once you've finished part a., part b. shouldn't require too much additional calculation.*)

Real Present Worth (Year 1 is the Base Year): $ _____86,692.05_____

The part a. 'present worth' is in Year 0 dollars.

To bring it into Year 1 dollars, we have to apply 1 year of deflation.

Something that cost $91,254.79 in Year 0 will cost (1 – 5%) x $91,254.79 = $86,692.05 in Year 1.

[Scratch Paper]

[Scratch Paper]

$$\text{IBCR}(X-Y)=\frac{B_X-B_Y}{C_X-C_Y}$$

APR to Interest: $i=(1+\frac{APR}{m})^m-1$

Continuous Compounding: $i_\infty=e^{APR}-1$

APR = Textbook's 'Nominal Interest Rate'

$$\frac{C_x}{C_Y}=\frac{CPI_X}{CPI_Y}$$

$R_t=C_t(P/F,\pi,t)$

π = Inflation (NOT 3.14159, etc.)

Current Dollars (Textbook) = Nominal Dollars (Economics)

After-tax MARR: $MARR_{at}\cong(1-t)MARR_{bt}$

After-tax IRR: $IRR_{at}\cong(1-t)IRR_{bt}$

Current (Working Capital) Ratio: Current Assets / Current Liabilities

Quick (Acid-Test) Ratio: Quick Assets / Current Liabilities

Equity Ratio: Total Equity / Total Assets

Return on Assets / Investment: Net Income / Total Assets

Return on Equity: Net Income / Total Equity

Debt / Equity Ratio: Total Liabilities / Total Equity

Asset Turnover Ratio: (Sales or Revenue) / Total Assets

Net Tangible Assets (Book Value): Total Assets – Intangible Assets – Liabilities

Accounting Identity: Assets = Liabilities + Equity

$(F/P,i,N) = (1+i)^N$	$(P/F,i,N) = (1+i)^{-N}$	$(A/F,i,N) = \frac{i}{(1+i)^N-1}$
$(F/A,i,N) = \frac{[(1+i)^N-1]}{i}$	$(A/P,i,N) = \frac{i(1+i)^N}{(1+i)^N-1}$	$(P/A,i,N) = \frac{(1+i)^N-1}{i(1+i)^N}$
$(A/G,i,N) = \frac{1}{i} - \frac{N}{(1+i)^N-1}$	$(P/A,g,i,N) = \frac{(P/A,i^o,N)}{1+g}$	$i^o = \frac{1+i}{1+g} - 1$

Capital Recovery Formula: $A = (P - S)(A/P,i,N) + Si$
Capitalized Value = A/i
Payback Period (Constant A) = First Cost / Annual Savings

$$EAC(N) = \left[P - S(N)(P/F,i,N) + \sum_{t=1}^{N} C(t)(P/F,i,t)\right](A/P,i,N)$$

$$\sum_{t=0}^{N} \frac{\sum C_t^j}{(1+IRR)^t} = 0$$

$$s_{tj} = \frac{p_{tj}q_{tj}}{\sum_{i=1}^{n} p_{ti}q_{ti}} \qquad L_t = \left(\sum_{i=1}^{n} \frac{p_{ti}}{p_{0i}} s_{0i}\right) \times 100$$