CPEN/EECE 481, Summer 2022 **Name** _____
Final Exam, 26/27 June 2021

Duration: More than 24 hours to complete. Due 9pm on June 27, 2022. 38% of your final score. Point values for each question are listed. Be sure to include the information below on your submission.

Last Name: _____
First Name _____
UBC Student #: _____

EXAM PROTOCOL

- Students are permitted to use any calculator and may use a spreadsheet program like Excel.
- If you have clarifying questions, please post them on Piazza. The instructor will monitor Piazza during this time and respond as quickly as possible.
- Late submissions will be penalized at the same rate as late assignments: 2% per hour.

WRITING THE EXAM

- I recommend using a pdf as the main submitted document, which contains all your final answers. Answers that are written only or involve simple calculations could be wholly contained in the pdf. Any problems that require more detailed calculation could be supported by calculations in a supporting Excel file, which you should submit as additional documentation, to show how you did the calculations.
- Read questions carefully, organize your thoughts and then proceed to write out your answer as neatly as possible.
- Keep your answers brief and to the point – see terms below to determine the level of detail required
- Explicitly state any assumptions you have made.
- Indicate your answers clearly and show work where possible to receive partial marks (e.g., formulas, cash flow diagrams, or notation).
- Remember that all costs and revenues listed as taking place in a year (such as 'year 1' occur on December 31st of that year, unless otherwise stated.
- Remember that interest rates given are in annual, nominal terms unless otherwise stated.

1. (4 points) An electronic data storage firm can purchase a bank of servers for $350,000. After five years of use, the servers are expected to have a salvage value of $15,000. What will the server's depreciation value in year 6 be (rounded to the nearest dollar), assuming:

   (a) They are classified as computer hardware, which is CCA Asset Class 50?
   (b) Straight line depreciation?
   (c) Sum-of-the-years'-digits depreciation?
   (d) Double declining-balance depreciation?

2. (4 points) Suppose two different wetlands restoration programs are being considered. Each would provide benefits to people by restoring ducks and duck hunting to a region. The benefits would grow each year as more and more ducks return to the region. The restoration efforts and the benefits of the efforts are expected to last 20 years.

   Plan 1 will cost $2.1 million to construct. Benefits will be $600,000 in the first year of operation, and will rise by $350,000 per year. Operating costs will be $1.2 million in the first year of operation, and will rise by $50,000 per year.

   Plan 2 will cost $3.8 million to construct. Benefits will be $950,000 in the first year of operation, and will rise by $350,000 per year. Operating costs will be $1.3 million in the first year of operation, and will rise by $80,000 per year.

   a) Using a 7 percent discount rate, what is the benefit/cost ratio of each of the plans (rounded to two decimal places)?
   b) What is the incremental B/C ratio?
   c) Which plan is better?

3. (5 points) Raheem must decide between two options for a new solar energy generation system. The infrastructure (capital) will be built immediately (year 0).

   Option A will cost $14 million and will last 5 years. It is expected to have a salvage value of $2 million at the end of the 5th year. Revenues in year 1 will be $4.4 million, and operational costs in year 1 will be $1 million. Option B will cost $20 million. It is expected to have a salvage value of $1.3 million at the end of the 5th year. Revenues in year 1 will be $6.6 million, and operational costs in year 1 will be $1.8 million.

   For both options: revenues and future operating costs are expected to rise at 2% per year after year 1. The combined federal and provincial incremental tax rate is 35%. Use a CCA depreciation rate of 45% and a discount rate of 5% (reflecting the borrowing costs of the firm).

   a) What is the gain or loss on disposal of Option A (rounding to the nearest dollar)?
   b) What is the gain or loss on disposal of Option B (rounding to the nearest dollar)?
   c) Determine the net present worth of the after-tax cash flow for each option.
   d) Which option should he recommend, or should he recommend not to purchase either?

4. (4 points) One of the analysis techniques we have learned is how to construct a choice table, showing which option would be selected across a range of borrowing interest rates. Why would the preferred option change due to changing borrowing interest rates?

5. (6 points) A firm is considering two possible capital asset purchases that could increase the firm's revenues.
The table below outlines key parameters for the two options.

Parameters	Option A	Option B
capital cost	$ 190,000	$ 240,000
CCA rate (d)	30%	40%
operating cost per yr	$ 80,000	$ 90,000
escalation rate on operating costs (%/yr)	2%	2%
sales revenues per yr	$ 110,000	$ 200,000
escalation rate on sales revenues (%/yr)	3%	3%
expected life of capital (n)	5	10
Salvage value	$ 8,000	$ 5,000
capital cost escalation rate	3%	3%
interest rate on loan	4%	4%
marginal tax rate	30%	30%
MARR (discount rate)	10%	10%

Analyses have been done for both of the options, in the attached Excel file for Problem 5.

Unfortunately, the analyst made 12 errors in the analysis. You must identify all of the errors, and describe why each one is an error. You do NOT have to fix the errors. Easy errors are worth fewer points than complex errors.

6. (3 points) Modifying an assembly line has a capital cost of $200,000, and will have no salvage value. The firm's borrowing interest rate is 7%. The revenue that the assembly line modification will create depends on whether the assembly line runs one, two, or three shifts, and on whether the product is made for three or five years.

Shifts/Day	Revenue/Year	Probability		Useful Life (years)	Probability
1	$48,000	0.18		3	0.65
2	66,000	0.60		5	0.35
3	85,000	0.22			

(a) What is the joint probability distribution for savings per year and useful life, rounded to three decimal places?
(b) What is the net present worth for each joint scenario, including the capital cost, rounded to the nearest dollar?
(c) What is the expected value of the net present worth, including all of the possible scenarios?

7. (5 points) You have finished your university degree, conducted interviews, and have received two job offers in different countries. Both jobs require you to commit to a 10-year-long contract. The pay structures of the contracts and the anticipated general price inflation in each country are listed below. You do not need to consider how exchange rates might impact the situation.

	Job offer 1	Job offer 2
Starting (year 1) salary	$128,000	$118,000
Contractually determined salary increase per year, years 2-5	2.3%	2.9%
Contractually determined salary increase per year, years 6-10	2.4%	4.6%
Anticipated annual inflation years 2-10	2.1%	1.0%

(a) How much would your salary be in year 10 under each option, as determined by the contractual terms above? (Another way to say this is what would your market salary be in year 10.) Round your answers to the nearest dollar.
(b) How much would your salary be in real terms (adjusted for inflation) in year 10 under each option?
(c) In which year would your real salary (adjusted for inflation) from job offer 2 be higher than from job offer 1? What are the real salary values for each job offer in that year?
(d) Which option would be better, and why?

8. (4 points) In the fleet purchase options analysis tool covered in class, one of the costs included was the 'lost interest on capital funds'. What does this refer to, and why would it be included in such an analysis? What key concepts covered in the course does it inclusion illustrate? Explain why and how.

9. (3 points) The private firm you work at has asked you to recommend a discount rate for the firm's use in evaluating potential investments in projects. What principle would you apply? What candidates would you recommend that the firm consider?