
Last Name

First Name

Student Number

UNIVERSITY OF SASKATCHEWAN
COLLEGE OF ENGINEERING
GE 348 ENGINEERING ECONOMICS
FINAL EXAM
TUESDAY, DECEMBER 8, 2020

Instructions:

- Exam Duration: 3 hours
- This Exam is Open Book.
- A formula sheet is provided as the last page.
- The student should work on this exam individually. The assessment is to inform the instructor the current learning outcomes. It would help the instructor to support you develop essential professional skills in the rest of the term.
- Students must ask permission to leave the examination room
- Show all your work.
- Please underline or **box** your final answer.
- **Show Cash Flow Diagrams where applicable.**

Part I: Multiple Choices

1. Of the following, what information is required to calculate depreciation allowances under straight-line depreciation?
 - a. Useful Life
 - b. Initial Cost
 - c. Salvage Value
 - d. CCA class

2. You open a credit card account that charges 1.5% interest each month on the unpaid balance. What is the effective annual interest rate?

3. An engineer deposits \$800 semiannually in his savings account for 5 years at 5% interest compounded semiannually. Then, for 5 years he makes no deposits or withdrawals. The amount in the account after 10 years is about _____?

4. A house is to be purchased for \$380,000 with a 20% down payment, thereby financing \$304,000 with a home loan and mortgage. A conventional 25-year loan is used at 3.5% compounded monthly, resulting in monthly payments of \$1,521.90. The interest portion of the first monthly payment will be what?

5. The life cycle costs of an asset include which of the following?
 - a. Purchase cost of the asset
 - b. Shipping and installation cost of the asset
 - c. Operating and maintenance cost of the asset
 - d. Salvage value of the asset

6. A company is using break-even analysis to determine how many units of a new product must be sold for the product to be profitable. Which of the following actions will cause the break-even point of a product to increase?

7. The following costs have been identified in relation to the production of a product:
 - a. Production costs
 - b. End of life disposal costs
 - c. Distribution costs
 - d. Design costs

8. Which of the following statements is/are true?
- a) Life Cycle Costing aims to ensure that a profit is generated over the entire life of a project.
 - b) Life Cycle Costing takes into account all costs over the life of a product, with the exception of costs already spent on the design and development.

9. A company is developing a new product and expects to sell 4,000 units per year over a period of 5 years.
- The life time cost of the product are:
 - Design and development \$50,000
 - Manufacturing \$5 per unit
 - End of life costs \$10,000

What is the life cycle cost per unit?

10. Product X is sold for \$600 per unit. The total cost of production per year, including capital recovery and a return, is given by the expression

$$TC = 0.04n^3 - 600n + 70,000$$

What is the maximum profit for a year?

11. Doing nothing is a viable investment alternative. True or False?

12. Please refer to the financial statements below and answer the following questions, please show two decimal points:
- a. What is the company's Current Ratio in 2019?
 - b. What is the company's Debt Ratio in 2019?
 - c. What is the company's Profit Margin in 2019?
 - d. What is the company's Return on Assets in 2019?

Balance Sheet

ASSETS	2019	LIABILITIES AND CAPITAL	2019
Current Assets		Current Liabilities	
Cash	\$61,750	Notes Payable	\$92,950
Accounts Receivable (net)	195,000	Accounts Payable	147,212
Inventory	65,000	Taxes Payable	69,438
Prepaid Expenses	22,750	Total Current Liabilities	\$309,600
Total Current Assets	\$344,500	Fixed Liabilities	
Fixed Assets		Loans	\$100,000
Machinery	\$208,000	Total Liabilities	\$409,600

Furniture	74,750	Capital	
Other	22,750	Stock	\$100,000
Total Assets	<u>\$650,000</u>	Retained Earnings	88,427
		Earned Surplus	51,973
		Total Capital	\$240,400
		Total Liabilities and Capital	<u>\$650,000</u>

Income Statement

Income Statement	2019
Net Sales	\$1,625,450
Cost of Goods Sold	
Beginning Inventory	\$50,000
Direct Materials	406,000
Direct Labor	801,500
Factory Overhead	94,603
Total	\$1,352,103
Less: Ending Inventory	65,000
Cost of Goods Sold	\$1,287,103
Gross Profit	\$338,347
Other Operating Expenses	
Selling Expenses	\$43,980
Depreciation & Amortization	58,122
General and Administrative	122,484
Total Other Operating Expenses	\$224,586
Net Operating Income	\$113,761
Less: Interest Expenses	\$21,600
Less: Income Taxes	40,188
Net Income	<u>\$51,973</u>

Part II: Numerical Questions

13. University of Saskatchewan (USask) is trying to determine whether to use no insulation or to use insulation that is either 1 inch thick or 2 inches thick on its steam pipes. The heat loss from the pipes without insulation is expected to cost \$2.50 per year per foot of pipe. A 1-inch thick insulated covering will eliminate 89% of the loss and will cost \$0.40 per foot. A 2-inch thick insulated covering will eliminate 92% of the loss and will cost \$0.85 per foot. USask Physical Plant Services estimates that there are 250,000 feet of steam pipe on campus. The USask Accounting Office requires a 10%/year return to justify capital expenditures. The insulation has a life expectancy of 10 years. Determine which insulation (if any) should be purchased
- Using Annual Value analysis.
 - Using B/C analysis

14. A new project will cost \$80,000 initially and will last for 7 years, at which time its salvage value will be \$5,500. Annual revenues are anticipated to be \$35,000 per year.

The project will be fully funded by a loan with an annual interest rate 5%. The loan will be paid back in 7 years in annual payments.

The interest paid each year can result in tax rebate. Tax rate is 30%.

Please draw a cash flow diagram of the project cash flow, investment, revenue, loan payment, and salvage.

For a *MARR* of 12%/yr, plot a sensitivity graph for Net Present Value versus initial cost, salvage value, annual revenue, and interest of the loan, and tax rate varying only one parameter at a time, each within the range of +/- 20% (5% step).