ELEC 481
Summer 2018

Final Exam

Name: _____

Instructions. (100 points) Solve each of the following questions. Show your work for full marks. All calculators are allowed. There is a list of formulas at the back of the exam. Round all answers to two decimal places.

(10^{pts}) **1.** Suppose you are considering a choice between two investments. One has an initial cost of \$800 and a payback period of 3 years. The other has an initial cost of \$1000 and a payback period of 4 years. Which is the better investment? Explain your answer.

10 pts

(10^{pts}) **2.** You are building a bridge in a growing city. You can either build a full-sized bridge for \$20 million today or build a smaller bridge for \$16 million today with an \$11 million expansion at some point in the future. However, you are unsure how many years it will be before the expansion is necessary. Calculate the break-even point where both plans would be equally good. Assume an interest rate of 5%.

10 pts

($10^{\text{pts}}_{\text{ea.}}$) **3.** Your company purchases a new piece of equipment for \$10,000. You can claim 30% depreciation each year (except the first, which is subject to the 50% rule).

(a) Compute the book value of the asset for the next three years.

20 pts

(b) Compute the cash flow from this purchase and the tax savings it generates for the next three years (starting with the purchase itself in year zero), assuming the company faces a 40% income tax rate.

($5^{\text{pts}}_{\text{ea.}}$) **4.** Your company purchases a new piece of equipment for \$9,000. The machine has a useful life of three years and a salvage value of \$0. It is expected to produce a net benefit of \$5,000 each year it is in use.

10 pts

(a) Using the straight-line depreciation method, compute the book value of the asset for the next three years. How much taxable income does the machine produce each year?

(b) If inflation caused both the annual costs and benefits of running the machine to increase by 2% per year (along with the general price level) would this raise or lower its real value? Explain your answer. (You do not need an explicit calculation.)

(10pts) **5.** Table 1 shows several mutually exclusive investment opportunities.

10 pts

Table 1: Investment Opportunities

	Expected Present Worth	Standard Deviation
Project A	\$10,500	\$5,000
Project B	\$20,000	\$7,000
Project C	\$15,800	\$15,000
Project D	\$18,900	\$6,000
Project E	\$5,000	\$0

Which of the projects could potentially be viable? Which should be eliminated from consideration? Explain your answer.

(10pts) **6.** Your firm uses a machine that costs \$7,000 to buy new. Its salvage value is \$0. Its maintenance costs start at \$1,000 and rise by \$1,000 each year it is in use. Find this machine's minimum EUAC. How many years should the firm keep the machine before replacing it? For simplicity, assume an interest rate of 0% and ignore taxation.

10 pts

($10^{\text{pts}}_{\text{ea.}}$) **7.** A company borrows \$30 million from banks at a rate of 8%. It issues \$30 million in bonds paying 6%. And it has \$40 million in equity. It estimates the equity shareholders require a 10% return. The company faces a corporate tax rate of 40%.

30 pts

(a) What is the cost of capital?

(b) Table 2 shows the projects that the firm could pursue. It can allocate its \$100 million in capital to some, but not all, of these projects. (Unlike in previous problems, these projects are NOT mutually exclusive!)

Table 2: Available Projects

	Cost	**Rate of Return**
Project 1	\$30 million	29%
Project 2	\$70 million	18%
Project 3	\$20 million	13%
Project 4	\$10 million	8%
Project 5	\$30 million	4%

What is the firm's opportunity cost?

(c) What is the firm's MARR? Explain why a new opportunity that offered a return less than this MARR would be rejected.

Formulas

Table 3: Useful Equations

Compound Amount	Find F given P	(F/P,i,n)	$F = P(1+i)^n$
Present Worth	Find P given F	(P/F,i,n)	$P = F(1+i)^{-n}$
Series Compound Amount	Find F given A	(F/A,i,n)	$F = A\left[\frac{(1+i)^n-1}{i}\right]$
Sinking Fund	Find A given F	(A/F,i,n)	$A = F\left[\frac{i}{(1+i)^n-1}\right]$
Capital Recovery	Find A given P	(A/P,i,n)	$A = P\left[\frac{i(1+i)^n}{(1+i)^n-1}\right]$
Series Present Worth	Find P given A	(P/A,i,n)	$P = A\left[\frac{(1+i)^n-1}{i(1+i)^n}\right]$
Real Interest Rate	Find i' given f and i		$i' = \frac{i-f}{1+f}$