

NOTE: Correct answers are highlighted in bold.

FINAL EXAM (Version 1)

- 1) If the equivalent effective annual interest rate is 25.5%, and interest is compounded in every 4 months, what is the corresponding nominal interest rate?
 - A) 25.5%
 - B) 23.6%**
 - C) 26.3%
 - D) 24.8%
 - E) 22.9%

- 2) Octavia is considering two mutually exclusive financial options: (i) to deposit \$4 000 in her bank's savings account that pays 4.6% annual interest, or (ii) to purchase a \$4 000 one-year guaranteed investment certificate with a monthly interest rate of 0.3%. From an opportunity cost standpoint, by making the decision to deposit \$4 000 in the bank account, Octavia will
 - A) lose \$57.6 by the end of the year
 - B) lose \$37.6 by the end of the year
 - C) gain \$57.6 by the end of the year
 - D) make zero economic profit
 - E) gain \$37.6 by the end of the year**

- 3) Jullianne is thinking of borrowing some money at a nominal interest rate of 19.3%. If the borrowed sum compounds twice in a year, what would be the equivalent effective annual interest rate?
 - A) 23.4%
 - B) 19.3%
 - C) 20.2%**
 - D) 19.8%
 - E) 24.1%

- 4) How long will it take for any deposit to triple in value if the annual interest rate is 10%?
 - A) 11.5 years**

- B) 8.1 years
 - C) 7.8 years
 - D) 12.3 years
 - E) 10 years
- 5) If you invest \$40,000 today at 10% interest rate, how much will you accumulate in 20 years?
- A) \$201,100
 - B) \$250,000
 - C) \$265,800
 - D) \$269,100**
 - E) \$310,500
- 6) What is the present worth of a total 30 payments that increase by a fixed sum of \$100, and is paid out at the end of every year. Note that the first payment of \$400 will be paid out at the end of the first year. Calculate the present worth given the interest rate of 10%, compounded annually.
- A) \$14,128.52
 - B) \$10,696.12
 - C) \$11,500.59
 - D) \$12,598.59
 - E) \$11,478.38**
- 7) Teodora has decided to upgrade the packaging machine in the production line of her plant. The initial cost would be \$180,000 with a salvage value of \$40,000 after six years. How much money must be saved every year to justify the investment at an interest rate of 10%?
- A) \$11,128.52
 - B) \$37,745.03**
 - C) \$38,501.95
 - D) \$12,895.94
 - E) \$14,478.38

- 8) You have \$100 to deposit. Bank A offers 16% interest, compounded annually, Bank B offers 15% interest, compounded monthly. How many years would you have to keep your money in the bank for Bank B to be a better choice?
- A) 5 years
 - B) Bank B is always better**
 - C) 6 years
 - D) Bank B is never better
 - E) 4 years
- 9) The price of money can be captured through
- A) the interest rate**
 - B) the present worth of an investment
 - C) the difference between benefits and costs that occur at different times
 - D) the consumer price index
 - E) the future worth of an investment
- 10) If you borrow \$1,000 now at 10% interest for 5 years, what is the compound interest owed for the fifth year?
- A) \$153.97
 - B) \$140.12
 - C) \$47.82
 - D) \$146.41**
 - E) \$123.57
- 11) The principal amount is
- A) the difference between the amount of money lent and the amount of money later repaid
 - B) the future value of money
 - C) the present value of money
 - D) the amount of money invested at the beginning**
 - E) the annual equivalent value of money

- 12) You need to borrow \$1,000 for a period of 10 years. Bank A will lend you the money at 10% interest, compounded annually, whereas Bank B will lend you the money at 10% interest, compounded monthly. At the end of ten years, how much more interest will you owe if you borrow from Bank B instead of Bank A?
- A) \$137.39
 - B) \$148.12
 - C) \$74.59
 - D) \$92.50
 - E) **\$113.30**
- 13) What makes one dollar in the future less desirable than one dollar today?
- A) **a forgone opportunity of investment**
 - B) variable interest rate
 - C) accumulated welfare of people
 - D) a diminishing purchasing power of money over time
 - E) None of the above
- 14) You invest \$10,000 at 5% interest rate compounded monthly, what is your accumulated interest at the end of year 2?
- A) **\$1,049.41**
 - B) \$1,025.00
 - C) \$537.79
 - D) \$511.62
 - E) \$1,089.41
- 15) The present worth factor, $(P/F, i, N)$,
- A) converts a series of repeated equal payments into the equivalent future amount
 - B) converts an annuity into the equivalent present amount
 - C) **converts the future amount that is equivalent to a present amount**
 - D) converts the future value equivalent to a series of equal payments
 - E) converts the present amount that is equivalent to some future amount

- 16) How much should be set aside each month to accumulate \$10,000 at the end of year 2 under effective monthly interest rate of 10%?
- A) **\$112.99**
 - B) \$177.78
 - C) \$152.17
 - D) \$122.14
 - E) \$196.41
- 17) The minimum acceptable rate of return (MARR) is
- A) the least interest rate among all alternative projects
 - B) an interest rate that allows an investor to recoup the investment
 - C) an interest rate, which is equal to a current bank interest rate
 - D) a highest interest rate among all alternative projects
 - E) **an interest rate that must be earned for a project to be accepted**
- 18) What is the present worth of an independent project that requires initial investment of \$50,000 and annual maintenance costs of \$4,000 for 10 years at a 10% minimum acceptable rate of return?
- A) – \$17,556
 - B) – \$4,000
 - C) – \$54,000
 - D) – **\$74,578**
 - E) – \$32,444
- 19) What would be an appropriate way to compare two projects with unequal lives?
- A) annual worth comparison method
 - B) future worth comparison method
 - C) incremental present worth comparison method
 - D) **study period method**
 - E) present worth comparison method

- 20) What is the exact payback period for a 15-year project that requires \$15,000 in initial investment, \$1,000 in annual maintenance costs and generates annual revenue of \$2,500 per year under 10% MARR?
- A) 7.5 years
 B) 5 years
 C) 15 years
D) 10 years
 E) 8.4 years
- 21) What is the major disadvantage of the internal rate of return method?
- A) It complicates the comparison of projects of the different sizes
 B) It ignores the time value of money
 C) It ignores the expected service life
 D) It discriminates against long-term projects
E) It can produce more than one internal rate of return
- 22) The following table summarizes information for five projects:

Project	First Cost (in \$)	IRR on Overall Investment	IRR on increments of investment Compared with Projects (%)			
			1	2	3	4
1	100,000	19%				
2	175,000	15%	9%			
3	200,000	18%	17%	23%		
4	250,000	16%	12%	17%	13%	
5	300,000	17%	14%	11%	17%	8%

The data can be interpreted in the following way: The IRR on the incremental investment between project 5 and project 4 is 16%.

If all projects are mutually exclusive and the company has at least \$1,025,000 to invest, which projects should be undertaken if the MARR is 10%?

- A) 3, 4 and 5
 B) 1, 3, 4, and 5

- C) 5 only
- D) 4 only**
- E) 3 and 5

- 23) The external rate of return must be used if
- A) a project requires multiple investments and generates multiple benefits
 - B) a project involves only simple investments
 - C) a project starts with cash outflow
 - D) it is impossible to calculate the minimum acceptable rate of return
 - E) there are multiple internal rates of return**
- 24) What are the two basic summary financial statements that provide information about a firm's revenues, expenses, assets and liabilities?
- A) the balance sheet and the cash flow statement
 - B) the statement of retained earning and the balance sheet
 - C) the cash flow statement and the statement of retained earning
 - D) the income statement and the balance sheet**
 - E) the income statement and the cash flow statement
- 25) What is depreciation?
- A) The accumulation of money in an interest-bearing account over time
 - B) The tendency of money in a bank account to lose value over time
 - C) The loss in an asset's value over time**
 - D) The decline in value of a future good due to the time we have to wait to receive that good
 - E) The decline in value of expected future income, due to inflation
- 26) You run a software development business in Toronto. You are offered a chance to bid on a government contract that you estimate will require 600 000 lines of code, deliverable in one year.
- You have developed a model: $\text{Effort} = 3.0(\text{KLOC})^{1.2}$ to predict the effort, in programmer-months, required to complete a job, where 'KLOC' stands for 'thousands of lines of

code'. On the basis of this model, how many programmers should you assign to work on the project?

- A) 6,500
- B) 1,800
- C) 540**
- D) 450
- E) 150

27) Mutually exclusive projects can be compared in terms of present worth if

- A) they have the same benefits
- B) they have the same depreciation rate
- C) they have the same service life**
- D) they have the same rate of return
- E) they have the same costs

28) Suppose that the CPI was 87.5 in 2000 and 132.2 in 2009. What is the value of \$50,000 in 2009 in terms of 2000 dollars?

- A) \$33,094**
- B) \$37,821
- C) \$43,750
- D) \$57,143
- E) \$66,100

29) Why do businesses want to depreciate their assets as soon as possible?

- A) to release funds for further reinvestment
- B) to streamline their cash flows in the long-run
- C) to decrease the amount of taxes they must pay**
- D) to balance their assets and liabilities
- E) to increase productivity of their operations

30) What was the goal of the Canadian government in designing the Capital Cost Allowance system?

- A) to calculate the total amount of taxes that the government collects from businesses' profits
 - B) to define a corporate tax rate that businesses must use while calculating the amount of their taxes
 - C) to define the after-tax minimum acceptable rate of return that businesses can use to account
 - D) for the effects of taxation while making their investment decisions to facilitate businesses in calculating their cash flows associated with the purchase of a long-term depreciable asset
 - E) to define a specific amount of depreciation that businesses may claim in any year for any one depreciable asset**
- 31) Suppose that the after-tax interest rate is 10%, and the corporate tax rate is 50%. What is the before-tax interest rate?
- A) 20%**
 - B) 10%
 - C) 40%
 - D) 5%
 - E) 15%
- 32) The price of a TV set was \$600 in 1999. In 2003 it was priced at \$520. If the CPI in 1999 was 123 and 2003 is the base year, has the TV set become cheaper or more expensive in real terms in 2003?
- A) Real-dollar cost of the TV set has decreased by 6.6%
 - B) Real-dollar cost of the TV set has not changed
 - C) Real-dollar cost of the TV set has decreased by 15.8%
 - D) Real-dollar cost of the TV set has increased by 15.8%
 - E) Real-dollar cost of the TV set has increased by 6.6%**
- 33) The Capital Cost Allowance system uses a _____ depreciation rate to calculate the depreciation allowance for capital assets
- A) straight-line
 - B) proportional
 - C) fixed
 - D) declining-balance**
 - E) arbitrary

- 34) I am considering a project which requires an immediate investment of \$10,000 and yields a return in two years. If I expect the rate of inflation to be 15%, how big, in actual dollars, must the return be if my real rate of return on the project is to be 20%?
- A) \$13,800
 - B) \$14,400
 - C) \$19,044**
 - D) \$13,500
 - E) \$18,225
- 35) For a five-year term investment, a bank offers me an annual interest rate of 10%. However, the average inflation rate for that duration is expected to be 5%. If I invest \$500 in the bank, what will the value of my investment be, in real dollars, in five years time?
- A) \$631**
 - B) \$805
 - C) \$638
 - D) \$1,028
 - E) \$396
- 36) A city council is planning to build a new bridge across a creek. This will require an immediate expenditure of \$50,000, but will save citizens an estimated \$5,000 in travel costs every year over the next twenty years. If the council's MARR is 10%, what is the Benefit-Cost Ratio (BCR) for the project?
- A) 0.1
 - B) 1.64
 - C) 2.00
 - D) 1.44
 - E) 0.85**
- 37) How should market failures be addressed?
- A) through the replacement of social equilibrium by market equilibrium
 - B) through the establishment of barriers to enter the market
 - C) through free market interactions between consumers and producers
 - D) through government intervention and the courts**

E) through market deregulations

38) A valuable asset was priced at \$1 million in 1995. What should be its nominal price in 2012 if the CPI was 95 in 1995 and 145 in 2012?

A) \$1.25 million

B) \$1.65 million

C) \$1.53 million

D) \$0.95 million

E) \$1.45 million

39) A city council is planning to build a new bridge across a creek. This will require an immediate expenditure of \$50,000, but will save citizens an estimated \$8,000 in travel costs every year over the next twenty years. Alternatively, they could renovate an existing bridge. This would only cost \$20,000, but the saving in travel costs would only be \$2,500 every year. If the council's MARR is 10%, what is the BCR for upgrading from the renovated bridge to the new bridge?

A) 1.20

B) 0.75

C) 1.64

D) 1.56

E) 2.00

40) There are four mutually exclusive alternatives to build a rural road. Present worth of social benefits and costs as well as benefit-cost ratios are presented in the following table:

Alternative	PW (Benefits)	PW (Costs)	BCR
A	100	80	1.25
B	150	85	1.76
C	170	100	1.70
D	200	150	1.33

Based on this information, what alternative should be chosen?

A) A

B) B

- C) C
- D) D
- E) None

41) Below the results of a scenario analysis are presented:

Case	Probability	Sales, units	Profit per unit
Worst	25%	80,000	\$30
Base	50%	100,000	\$40
Best	25%	120,000	\$60

What is the expected value of total profit according to this analysis?

- A) \$3.6 million
 - B) \$4.4 million**
 - C) \$3.2 million
 - D) \$2.8 million
 - E) \$4.2 million
- 42) You are offered a chance to buy a ticket in a lottery. You have a one in ten chance of winning this lottery. If you win, your name will be entered along with 399 other winners as an entrant in a second lottery. All the entrants in the second lottery have an equal chance of winning the single prize, a sports car valued at \$400,000. What is the most it would be rational for you to pay for a ticket in the first lottery?
- A) \$400.12
 - B) \$40.96
 - C) \$10.19
 - D) \$100.25**
 - E) \$1,000.37
- 43) If a decision tree shows the possible profits associated with each of several alternative decisions, what is the optimal decision strategy?
- A) the strategy that minimizes the risk of obtaining the lowest possible profit
 - B) the strategy that has the maximum profit as one of its possible outcomes
 - C) the strategy that results in the highest expected value of profit**
 - D) the strategy that minimizes the variance in profit

E) the strategy for which the sum of leaf-node values is a maximum

44) In general, sensitivity analysis can be described as

A) establishing the level of data errors

B) predicting profitability of a project

C) establishing the impacts of uncertainty in a project's inputs on its economic performance

D) establishing the range of variations in the key parameters of a project

E) gaining a better understanding of how cash flows affect a project's performance

45) First cost of a construction project depends on weather. Historical weather data shows that in the fall weather is warm 20% of the time, it is cold 30% of the time and it is somewhat in between 50% of the time. During warm weather first cost is expected to be \$225,000, during cold weather \$295,000 and \$250,000 in between. What is the expected value of the first cost?

A) \$252,000

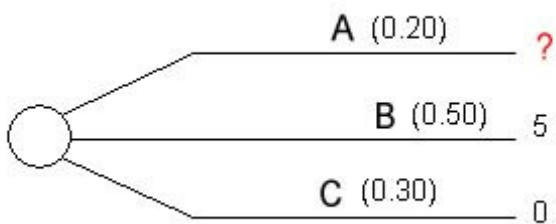
B) \$258,500

C) \$225,000

D) \$295,000

E) \$250,000

46) The decision tree of a project is represented by the following graph:



What is the outcome of an alternative A if the expected monetary value of a project is \$4.56?

A) \$10.3

B) \$2.0

C) \$8.4

D) \$2.5

E) \$5.0

47) Future annual revenue generated by a project is a random variable. Its probability distribution function is given as follows

Value, \$/year	Probability
10,000	0.1
20,000	0.4
30,000	0.1
40,000	0.3
50,000	0.1

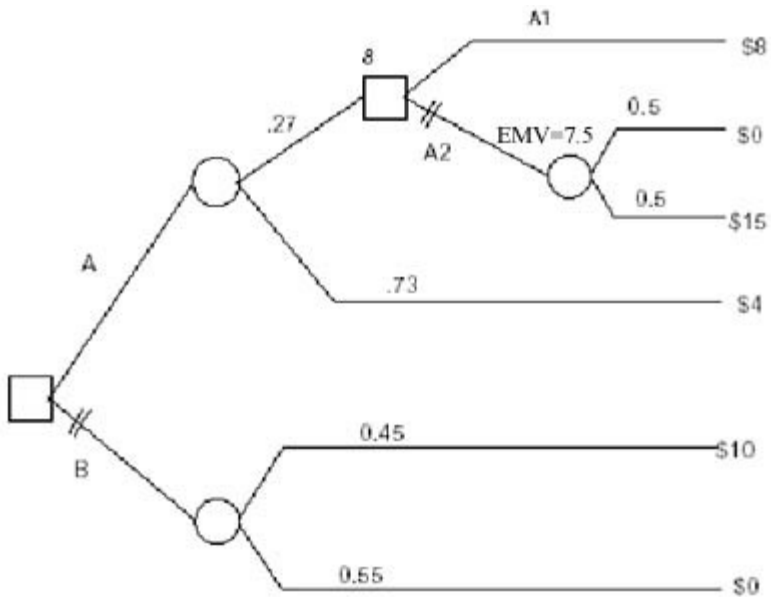
What is the probability of annual revenue being higher than \$30 000/year?

- A) 0.3
- B) 0.1
- C) 0.4**
- D) 0.5
- E) 0.6

48) As a rule, potential values of a random variable in a decision tree are represented by

- A) chance nodes**
- B) branches
- C) payoffs
- D) decision nodes
- E) links

49) A decision tree of a project is given as follows:



What is the expected value of alternative A?

- A) \$5.08
- B) \$4.98
- C) \$9.66
- D) \$5.91
- E) \$8.83

50) A one-year project has \$60 million as initial investment and generates a savings of \$80 million at the end of the year. What is the project's IRR?

- A) 22.1%
- B) 33.3%
- C) 28.7%
- D) 25.0%
- E) 19.5%

Final

List of Useful Formulas

Name	Symbol and Formula
Compound amount factor	$(F/P, i, N) = (1 + i)^N$
Present worth factor	$(P/F, i, N) = 1 / (1 + i)^N$
Sinking fund factor	$(A/F, i, N) = i / [(1 + i)^N - 1]$
Uniform series compound amount factor	$(F/A, i, N) = [(1 + i)^N - 1] / i$
Capital recovery factor	$(A/P, i, N) = \{i(1 + i)^N\} / [(1 + i)^N - 1]$
Series present worth factor	$(P/A, i, N) = [(1 + i)^N - 1] / \{i(1 + i)^N\}$
Arithmetic gradient to annuity conversion factor	$(A/G, i, N) = [1/i] - [N / \{(1 + i)^N - 1\}]$
Geometric gradient to present worth factor	$(P/A, g, i, N) = (P/A, i_0, N) / \{1 + g\}$ $(P/A, g, i, N)$ $= [\{(1 + i_0)^N - 1\} / \{i_0 (1 + i_0)^N\}] * [1 / \{1 + g\}]$ $i_0 = [(1 + i) / (1 + g)] - 1$
Capitalized value formula	$P = A / i$
Capital recovery formula	$A = (P - S) (A/P, i, N) + Si$
Payback period	Payback period $= \text{First cost} / \text{Annual savings}$
Effective interest rate (i_e), annual nominal interest rate (r), number of sub-period (m), and nominal interest for each sub-period (i_s)	$i_s = r / m$ $i_e = (1 + i_s)^m - 1$ $i_e = (1 + r / m)^m - 1$

Name	Symbol and Formula
Depreciation charge for period n using the straight-line method	$D_{sl}(n) = (P - S) / N$
Depreciation rate for period n using the declining-balance method	$d = 1 - (S/P)^{1/n}$
Current interest rate (i), real interest rate (i'), and inflation rate (f)	$i = (1 + i') (1 + f)$
Benefit-Cost Ratio (BCR)	$BCR = PW(\text{users' benefits}) / PW(\text{sponsors' cost})$
Modified Benefit-Cost Ratio (BCRM)	$BCR = [PW(\text{users' benefits}) - PW(\text{sponsors' operating costs})] / PW(\text{sponsors' capital cost})$
For two projects – X & Y – the Benefit-Cost Ratio, BCR (X – Y)	$BCR (X - Y) = \{B_x - B_y\} / \{C_x - C_y\}$

DISCRETE CASH FLOW AND COMPOUNDING
10.00 % DISCRETE RATE OF INTEREST

n	(F/P,i%,n)	(P/F,i%,n)	(A/P,i%,n)	(P/A,i%,n)	(A/F,i%,n)	(F/A,i%,n)	(A/G,i%,n)
1	1.1000	0.9091	1.1000	0.9091	1.0000	1.0000	0.0000
2	1.2100	0.8264	0.5762	1.7355	0.4762	2.1000	0.4762
3	1.3310	0.7513	0.4021	2.4869	0.3021	3.3100	0.9366
4	1.4641	0.6830	0.3155	3.1699	0.2155	4.6410	1.3812
5	1.6105	0.6209	0.2638	3.7908	0.1638	6.1051	1.8101
6	1.7716	0.5645	0.2296	4.3553	0.1296	7.7156	2.2236
7	1.9487	0.5132	0.2054	4.8684	0.1054	9.4872	2.6216
8	2.1436	0.4665	0.1874	5.3349	0.0874	11.4359	3.0045
9	2.3579	0.4241	0.1736	5.7590	0.0736	13.5795	3.3724
10	2.5937	0.3855	0.1627	6.1446	0.0627	15.9374	3.7255
11	2.8531	0.3505	0.1540	6.4951	0.0540	18.5312	4.0641
12	3.1384	0.3186	0.1468	6.8137	0.0468	21.3843	4.3884
13	3.4523	0.2897	0.1408	7.1034	0.0408	24.5227	4.6988
14	3.7975	0.2633	0.1357	7.3667	0.0357	27.9750	4.9955
15	4.1772	0.2394	0.1315	7.6061	0.0315	31.7725	5.2789
16	4.5950	0.2176	0.1278	7.8237	0.0278	35.9497	5.5493
17	5.0545	0.1978	0.1247	8.0216	0.0247	40.5447	5.8071
18	5.5599	0.1799	0.1219	8.2014	0.0219	45.5992	6.0526
19	6.1159	0.1635	0.1195	8.3649	0.0195	51.1591	6.2861
20	6.7275	0.1486	0.1175	8.5136	0.0175	57.2750	6.5081
21	7.4002	0.1351	0.1156	8.6487	0.0156	64.0025	6.7189
22	8.1403	0.1228	0.1140	8.7715	0.0140	71.4027	6.9189
23	8.9543	0.1117	0.1126	8.8832	0.0126	79.5430	7.1085
24	9.8497	0.1015	0.1113	8.9847	0.0113	88.4973	7.2881
25	10.8347	0.0923	0.1102	9.0770	0.0102	98.3471	7.4580
26	11.9182	0.0839	0.1092	9.1609	0.0092	109.1818	7.6186
27	13.1100	0.0763	0.1083	9.2372	0.0083	121.0999	7.7704
28	14.4210	0.0693	0.1075	9.3066	0.0075	134.2099	7.9137
29	15.8631	0.0630	0.1067	9.3696	0.0067	148.6309	8.0489
30	17.4494	0.0573	0.1061	9.4269	0.0061	164.4940	8.1762