INDENG 120: Principles of Engineering Economics, Spring 2024

# Midterm 1

February 12, 2024

**Instructions:**

1. We have 4 versions of this midterm with equivalent difficulty. You are randomly assigned to **version A**. Please make sure you submit the solution to your own version.
2. You may not discuss the exam with anyone, in the class or not.
3. One double-sided cheat sheet (typed or handwritten) and a calculator are allowed.
4. Time: 10:10am - 11:00am.
5. Please fill in the circle of your solution on the answer sheet, and we will only grade your answer choices based on the answer sheet.
6. Please fill in **the version of your test** on the answer sheet (at the bottom right corner). **If you do not do this, you risk being incorrectly graded.**
7. For certain questions, there are boxes to show work. You must show your work in the boxes provided to receive partial credit.
8. If you don't know how to answer a question, skip it and return to it later. The questions are not ordered in terms of difficulty.
9. Have Fun and Good Luck!

Name: _____

Student ID Number: _____

# Multiple Choice Questions – 14 Points

**Instructions:** Please fill in exactly one response for each of the following 14 questions on answer sheet. Each question is worth 1 point. You must show your work in the boxes provided to receive partial credit.

1. Which of the following statements are FALSE?
   A. Book value of equity = Stockholder's value of equity.
   **B. If there are no interest expenses, Net Income = EBIT * Tax rate**
   C. "C" corporations are subject to double taxation, while "S" corporations aren't.
   D. Not all owners of a limited partnership are subject to full liability for the firm.

2. Suppose Anycolor Inc. is an "S" corporation with earnings of 10 million this year. It distributes these earnings to its 1 million shareholders. Corporate tax is 50% and personal income tax is 50%. How much per share is left after **all taxes are paid?**
   A. $3.00
   B. $2.50
   **C. $5.00**
   D. $0.00

   *You may show your effort to Question 2 in the following box*:

3. Refer to question 2. Suppose Anycolor Inc. was instead a "C" corporation instead of an "S" corporation. Now, how much per share would be left over **after all taxes are paid?**
   A. $1.00
   B. $5.00
   C. $7.50
   **D. $2.50**

   *You may show your effort to Question 3 in the following box*:

4. Which of the following types of firms results in the firm being a legal entity, separate from the firm's holders?
   **A. Corporations**
   B. Limited Partnerships
   C. Limited Liability Companies
   D. Sole Proprietorships

Please refer to the following financial statements for Cover Corp. for questions 5, 6, and 7. (All values are listed in millions.)

| Balance sheet | 2018 | 2019 |
|---|---|---|
| Assets | | |
| Cash | 70.6 | 80.6 |
| Accounts Receivable | 77.1 | 84.8 |
| Inventory | 32.2 | 35.3 |
| Total Current Assets | 179.9 | 200.7 |
| Net Property, Plant & Equip. | 346.1 | 350.9 |
| Goodwill & Intangibles | 364.8 | 364.8 |
| Total Assets | 890.8 | 916.4 |
| Liabilities & Stockholders' Equity | | |
| Accounts Payable | 36.2 | 40.3 |
| Total Current Liabilities | 36.2 | 40.3 |
| Long-term Debt | 597.1 | 597.1 |
| Total Liabilities | 633.3 | 637.4 |
| Stockholders' Equity | 257.5 | 279.0 |
| Total Liabilities & Stockholders' Equity | 890.8 | 916.4 |

| Income Statement | 2018 | 2019 |
|---|---|---|
| Revenue | 512.3 | 608.3 |
| Cost of Goods Sold | (251.4) | (290.0) |
| Gross Profit | 260.9 | 318.3 |
| Sales and Marketing | (101.8) | (121.6) |
| Administration | (66.2) | (78.7) |
| Depreciation & Amortization | (36.5) | (38.4) |
| EBIT | 56.4 | 79.6 |
| Interest Income (Expense) | (38.0) | (40.8) |
| Pretax Income | 18.4 | 38.8 |
| Income Tax | (6.4) | (13.6) |
| Net Income/Earnings | 12.0 | 25.2 |

5. Given that there are 1 million shares for Cover Corporation, what is their net earnings per share in 2018?

   A. $13

   **B. $12**

   C. $11

   D. $10

   *You may show your effort to Question 5 in the following box*:

6. Given that there are 1 million shares for Cover Corporation, what would be the change in Cover Corporation's book value of equity per share between 2018 and 2019?

   **A. $25.60**

   B. $14.75

   C. -$14.75

   D. -$25.60

   *You may show your effort to Question 6 in the following box*:

7. What can we not determine from solely the Balance sheet and Income statement given for Cover Corporation above?

   A. A measure of Cover Corporation's profit over 2018 and 2019.

   B. A snapshot of Cover Corporation's financial position in 2018 and 2019.

   **C. The amount of cash that Cover Corporation has generated over 2018 and 2019.**

   D. We are able to determine all the above values using solely the balance sheet and income statement given for Cover Corporation.

8. You are expecting to receive the following cash flows from an investment: \$10,000 at the end of the first year, \$20,000 at the end of the second year, and \$30,000 at the end of the third year. If the discount rate is 10% per year, what is the present value of these cash flows?

   **A. \$48,159.28**

   B. \$50,450.95

   C. \$52,892.53

   D. \$47,619.05

   *You may show your effort to Question 8 in the following box*:

9. Suppose a perpetuity you received rose from \$1.00 to \$1.20 per year. If the risk free interest rate is 5%, what would be the difference between the old and new perpetuity?

   A. Increase by \$2.00

   **B. Increase by \$4.00**

   C. No change

   D. Decrease by \$2.00

   *You may show your effort to Question 9 in the following box*:

10. You invested \$250,000 in a project that promises to pay you \$50,000 at the end of the first year, \$100,000 at the end of the second year, and \$150,000 at the end of the third year. What is the IRR of this investment?
    *The following two inequalities may help:*
    $-250,000 + \frac{50,000}{(1+.1)} + \frac{100,000}{(1+.1)^2} + \frac{150,000}{(1+.1)^3} < 0$
    $-250,000 + \frac{50,000}{(1+.05)} + \frac{100,000}{(1+.05)^2} + \frac{150,000}{(1+.05)^3} > 0$

    A. 10.50%

    B. 15.75%

    C. 12.33%

    **D. 8.21%**

*You may show your effort to Question 10 in the following box*:

11. Consider two mutually exclusive projects, A and B. Project A requires an initial investment of $100,000 and promises returns of $40,000, $50,000, and $60,000 at the end of each of the next three years, respectively. Project B requires an initial investment of $120,000 and promises returns of $60,000 at the end of each of the next three years. Assuming a discount rate of 10%, which project should be chosen based on NPV?

    A. Project A, because it has a higher NPV.

    **B. Project B, because it has a higher NPV.**

    C. Neither, as both have the same NPV.

    D. Project A, because it requires a lower initial investment.

*You may show your effort to Question 11 in the following box*:

12. You plan to save $5,000 at the end of each year for the next 20 years in an account that pays 8% annual interest. What will be the future value of this annuity at the end of 20 years?

    A. $247,115.89

    B. $215,892.50

    **C. $228,809.82**

    D. $231,456.76

*You may show your effort to Question 12 in the following box*:

13. You want to buy a car, and there is a $100,000 car that caught your eye. Unfortunately, you are only able to put down $60,000, and need to borrow the remaining $40,000 on a 10 year loan with monthly payments. Given a monthly interest rate of .5%, what is your monthly payment?

    A. $424.24

    **B. $444.08**

    C. $504.78

    D. $442.56

*You may show your effort to Question 13 in the following box*:

14. Consider three securities with the following characteristics:
Security A: Price Today: \$100, Cash Flow in One Year: \$0, Cash Flow in Two Years: \$150
Security B: Price Today: \$100, Cash Flow in One Year: \$160, Cash Flow in Two Years: \$0
Security C: Price Today: \$150, Cash Flow in One Year: \$80, Cash Flow in Two Years: \$100

A new security, Security D, with cash flows of \$80 in one year and \$150 in two years, is trading for \$180. Is there an arbitrage opportunity available? If yes, what is the arbitrage strategy?

A. Yes. Sell 1 share of Security D for \$180, buy 1 share of Security A for \$100, and buy 1 shares of Security B for \$100, realizing a net loss of \$20.

**B. Yes. Sell 2 shares of Security D for \$360, and buy 2 shares of Security A and 1 share of Security B, with the total price being \$300, realizing a net benefit of \$60.**

C. Yes. Buy 1 share of Security D for \$180, and sell 1 share of Security A for \$100 and 1 share of Security B for \$100, realizing a net cost of \$20.

D. No arbitrage opportunity exists.