DERIVATIVES AND RISK MANAGEMENT
END TERM EXAMINATION, SEPTEMBER 2021
TIME: 2 HOURS 30 MINUTES
TOTAL MARKS 50

Instruction: Show all the steps involved in solving the problems.

Section A (30 marks)

1. A) i) What is a short position in a forward contract? Draw the payoff diagram for a short position at a forward price of $103, if the possible range of the underlying stock price is $50-150.

ii) A bond will pay a coupon of $4 in two months' time. The bond's current price is $99.75. The two-month interest rate is 5% and the three-month interest rate is 6%, both in continuously compounded terms.

(a) What is the arbitrage-free three-month forward price for the bond?
(b) Suppose the forward price is given to be $97. Identify if there is an arbitrage opportunity and, if so, how to exploit it.
(5 marks x 2) (CILO 2)

OR

1. B) An oil refining company enters into 1,000 long one-month crude oil futures contracts on NYMEX at a futures price of $43 per barrel. At maturity of the contract, the company rolls half of its position forward into new one-month futures and closes the remaining half. At this point, the spot price of oil is $44 per barrel, and the new one-month futures price is $43.50 per barrel. At maturity of this second contract, the company closes out its remaining position. Assume the spot price at this point is $46 per barrel. Ignoring interest, what are the company's gains or losses from its futures positions? (5 marks) (CILO 2)

ii) Brown Corporation had an average days' sales outstanding of 19 days in 2005. Brown wants to decrease its collection period in 2006 to match the industry average of 15 days. Credit sales in 2005 were $300 million, and Brown expects credit sales to increase to $390 million in 2006. To achieve Brown's goal of decreasing the collection period, what should be the change in the average accounts receivable balance from 2005 to 2006 that must occur?
(5 marks) (CILO 2)

2. A

A bond will pay a coupon of $4 in two months' time. The bond's current price is $99.75. The two-month interest rate is 5% and the three-month interest rate is 6%, both in continuously compounded terms.

(a) What is the arbitrage-free three-month forward price for the bond?
Three months ago, an investor entered into a six-month forward contract to sell a stock. The delivery price agreed to was $55. Today, the stock is trading at $45. Suppose the three-month interest rate is 4.80% in continuously compounded terms.

a) Assuming the stock is not expected to pay any dividends over the next three months, what is the current forward price of the stock?

b) What is the value of the contract held by the investor?

c) Suppose the stock is expected to pay a dividend of $2 in one month, and the one-month rate of interest is 4.70%. What are the current forward price and the value of the contract held by the investor? (10 marks) (CILO 1)

OR

2. B)
Explain the following terms in the context of options: long, short, call, put, American, European, in-the-money, out-of-the-money, at-the-money, strike, holder, writer, expiry, premium, over-the-counter, and exchange-traded. (CILO 1)(5 marks)

3. A) i) A call option has an exercise price of $310 and is at expiration. The option costs $12, and the underlying stock trades for $325. Assuming a perfect market, how would you respond if the call is an American option? State exactly how you might transact. How does your answer differ if the option is European? Explain clearly. (CILO 2) (5 marks)
ii) . Kevin gets the following information on call options on Apple Computers:

Time to Maturity		Exercise Price	Call Price
Call 1	Jan	$120	$18.75
Call 2	Jan	$115	$13.30

Are these options correctly priced? If not, how can you profit through arbitrage? Show all your work.

(CILO 2) (5 marks)

OR

3. B) Call options on a stock are available with strike prices of $30, $35, and $40 and expiration dates in three months. Their prices are $8, $4, and $1, respectively. Explain how the options can be used to create a butterfly spread. Construct a table showing how profit varies with stock price for the butterfly spread.

(10 marks) (CILO 2)

Section B (20 marks)
Important: Please demonstrate all the steps for computation

4. a. Suppose Amazon is trading at a price of $180. Jenelle is evaluating an option to buy Amazon at $200 with maturity in 3 months. If the risk free rate of interest is 5% per year and the volatility of Amazon's stock is 40%, what should be the value of a European call option on Amazon?

I. Compute the value of a European put option on Amazon using Black-Scholes model.

II. What happens to the delta [N (d1)] of call option if Amazon's stock price rises to $1000? Explain clearly. How does this impact call option price?

III. What happens to the delta of the call option if Amazon's stock price drops to $50? How does this impact the value of the call option on Amazon?

IV. What happens to the value of the call option if the stock pays a dividend of $2 per share and the ex-dividend date is 2 months from now?

(5 marks x 4) (CILO 3)