



**Strathmore**  
UNIVERSITY

STRATHMORE INSTITUTE OF MATHEMATICAL SCIENCES  
BACHELOR OF BUSINESS SCIENCE IN FINANCIAL ENGINEERING  
END OF SEMESTER EXAMINATION  
BSF 4238 FINANCIAL INNOVATION AND STRUCTURED FINANCE

DATE: 11<sup>th</sup> December 2023

Time: 10:30 – 12:30

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**Instructions**

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

**QUESTION ONE (40 MARKS)**

1. Majority of financial innovations involve different ways of bundling or unbundling more basic instruments such as bonds, equities, commodities and currencies. Discuss 3 possible source drivers of financial innovation and a type of product that resulted from such innovation (6 marks).
2. Take  $N = 2$  and let  $S(0) = 100$ , Up Move Rate,  $U = 35\%$ , down move rate,  $D = -15\%$ , Discount rate,  $R = 5\%$ . Consider an American call with exercise price  $K = 100$ . Determine the current value of the American call price process  $C(0)$  (4 Marks)
3. Derive the Black-Scholes Pricing PDE using the Hedging and the Replication Arguments (10 marks).
4. In a conference on “The Role of the Financial Engineers in Financial Deepening and Market Vibrance”, you are invited to highlight the benefits of securitization of assets. Explain 3 such benefits to be yielded for the African Financial Markets. (6 marks)
5. A parity condition is a no-arbitrage condition representing an equilibrium state under which investors cannot obtain a risk-less profit. Show the parity conditions present in forward contracts and option contracts (4 Marks)
6. Explain the securitization process of a non-performing loan portfolio, clearly describing the roles of the SPV, Originator, Servicers, Credit Enhancer, Trustee, Underwriters with relevant processes diagrams (10 Marks)

**QUESTION TWO (15 Marks)**

1. Differentiate the following types of exotic options and structured products as used in hedging and speculation in forex, currency, equity and energy markets. Show their respective payoff structures. (10 marks)
  - i. Chooser Option
  - ii. Forward Start Option
  - iii. Spread Option
  - iv. Power Option
  - v. Rainbow Option
  - vi. Lookback Option
  - vii. Binary Option
  - viii. Himalaya
  - ix. Asian
  - x. Digital
2. Discuss ethical considerations that institutions should observe when structuring and selling CDOs. (5 Marks)

**QUESTION THREE (15 Marks)**

1. Explain the following approaches in deploying hedging strategies (5 Marks)
  - a) Model-dependent Hedging
  - b) Model Independent Hedging
  - c) Margin Hedging
2. Describe the following terms as understood in the context of commodities futures markets (4 marks)
  - a) Contango
  - b) Backwardation
3. Discuss 3 benefits of holding and development of investment funds (6 marks)

**QUESTION FOUR (15 Marks)**

1. Differentiate between the following types of arbitrage (3 marks)
  - a) Spatial Arbitrage
  - b) Statistical arbitrage
  - c) Strategical arbitrage
2. Black swans and contagious market events in the economy can bring about challenges in designing, pricing and writing of structured products. Discuss any 4 of such challenges (8 Marks)
3. Option trading strategies involve taking different positions in different types of options, and are commonly employed by investors to hedge against risks. Differentiate between the following option trading strategies and their payoff diagrams (4 Marks)
  - i. Straddle
  - ii. Buttery
  - iii. Strangle
  - iv. Covered Call

**QUESTION FIVE (15 Marks)**

1. A structured product is a pre-packaged financial product for facilitating customized risk-return objectives based on the returns from certain investable assets. It is used as an alternative to direct investment. Explain the following structured products (5 marks)
  - a) Wedding Cake
  - b) Himalaya
  - c) Phoenix
  - d) Twin-win
  - e) Shark Fin
2. “Africa is estimated to need an additional \$500 billion to \$1.2 trillion annually for sustainable finance for a range of SDG areas, including agriculture, renewable energy, transportation, water, health, and education. Climate change financing is a major need. Many parts of Africa are already suffering from its negative effects. Securitization could help raise that financing (Milken Institute, 2021)” Explain, giving an example of a product for the critical SDG areas, how securitization could help solve this financing concerns for Africa. (10 marks)