



# **MAASAI MARA UNIVERSITY**

**REGULAR UNIVERSITY EXAMINATIONS**

**2021/ 2022 ACADEMIC YEAR**

**THIRD YEAR FIRST SEMESTER**

**SCHOOL OF PURE, APPLIED AND HEALTH  
SCIENCES.**

**DEGREE IN APPLIED STATISTICS WITH  
COMPUTING.**

**COURSE CODE: STA 3126**

**COURSE TITLE: FINANCIAL MATHEMATICS II**

**DATE: 8<sup>TH</sup> APRIL, 2022**

**TIME: 1100-1300**

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**INSTRUCTIONS TO CANDIDATES**

**Answer Question ONE and any other TWO questions**

*This paper consists of FOUR printed pages. Please turn over.*

### Question One (30 marks)

(a) Design the following terms

- (i) Forward contract
- (ii) Long forward
- (iii) Long Call
- (iv) Short put
- (v) Zero sum Game

(5 marks)

(b) Give five assumptions of Black-Scholes Model (5 marks)

(c) Define the following terms

- (i) Volatility smile
- (ii) Volatility skew
- (iii) Implied volatility
- (iv) Risk-free Investment
- (v) Risky Investment

(5 marks)

(d) What are the characteristics of a one-period binomial model

(2 marks)

(e) Forward has 1.25 years remaining to expiration date. The risk free rate is 0.02, the forward price is 90 and the underlying asset price is 95. What is the price of the forward.

(5 marks)

(f) The underlying asset price is 1.6 and the risk free interest rate is 0.02. What is the expected underlying asset price in two years. (4 marks)

(g) Describe a one-period binomial pricing model (4 marks)

### Question Two (20 marks)

(a) If the underlying asset price is 95, and the current price is 85 and has 0.25 years to expiration date. The risk free interest is 0.02 and the volatility is 0.65. What is the option value. (10marks)

(b) If the underlying asset price is 24, and the strike price is 20. The risk free interest is 0.03 and the underlying asset volatility is 0.25. What is the probability that the underlying asset price will be greater than the strike price in three years. (10 marks)

**Question Three (20 marks).**

- (a) If the underlying asset price is 25, and the strike price is 35. The risk free interest rate is 0.04 and the underlying asset volatility is 0.45. What is the expected underlying asset price in three years given that the market price is less than the strike price. (10 Marks)
- (b) Given the following  $S_0 = 50$ ,  $U = 1.1$ ,  $D = 1/1.1$ ,  $K = 49$ ,  $T = 1$ ,  $n = 1$  and  $r = 0.06$ . What is the value of the option. (10 marks)

**Question Four (20 marks)**

- (a) Explain how to obtain the Black-Scholes equation for the long put value (10marks)
- (b) Explain the Black-Scholes equation for value of call option and put option. Show that options are zero sum games. (10 marks)

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