CMW

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

2025/2026 ACADEMIC YEAR

STA 2418: STOCHASTIC CALCULUS

STA 2455: STOCHASTIC CALCULUS II

(BSc. ACTUARIAL SCIENCE & BSc. OPERATIONS RESEARCH)

CAT 1 **2nd December, 2025**

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1. Consider a game where the coin is tossed 3 times.
   Based on the observations, define the associated probability space.
   [6 Marks]
2. Define any five (5) properties of Ito integrals. [5 Marks]
3. Consider the Brownian Motion with Drift process plus Jump given by:

$$Y_t = \mu t - W_t + \alpha N_t$$

Where $\mu = 2.5$; $\alpha = 0.7$; $\lambda = 2$.

Simulate the sample path for $0 \leq t \leq 1$.

[9 Marks]

4. Consider the Brownian Bridge Process given by:

$$B_t = W_t - tW_1 \quad ; \quad 0 \leq t \leq 1$$

Prove whether or not B_t is a martingale. [5 Marks]

5. Find an expression for the $cov(N_s, N_t)$; $0 \leq s \leq t$

[5 Marks]