UGANDA MARTYRS UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF NATURAL SCIENCES

FINAL EXAMS FOR BSc. Financial Mathematics YEAR 2

SEMESTER II, 2021/2022

MTF 2201: INTRODUCTION TO FINANCIAL ENGINEERING

DATE: 22/7/2022

TIME: 9:30 am – 12:30 pm

Instructions

1. Attempt ANY FOUR questions
2. Ensure that your name and registration number is indicated on the cover page of your work.
3. Where applicable, leave your answer in fractional form or round it to 2dp
4. Only Non-Programmable calculators are allowed

Carry out an analysis for the risk of a portfolio based on the following scenarios:-

(i) Security returns perfectly positively correlated **[4 marks]**

(ii) Security returns perfectly negatively correlated **[4 marks]**

(iii) Security returns uncorrelated **[4 marks]**

(c) Emmanuel would like to invest in Uganda securities exchange

(i) Identify the kind of security he should trade in and give a reason **[2 marks]**

(ii) Describe the procedure he would undertake to trade in this security **[5 marks]**

Question 3

(a) Differentiate between systematic risk and unsystematic risk **[4 marks]**

(b) Outline the major limitations of expected return **[3 marks]**

(c) Describe the importance of diversification in investment **[4 marks]**

(d) Assume stock A, stock B and stock C are real estate stocks in a portfolio having weights in the portfolio of 20%, 35% & 45% respectively. The standard deviation of the assets is 2.3%, 3.5%, and 4%. The correlation coefficient between A and B is 0.6; between A and C is 0.8 and between B and C is 0.5. Determine:-

(i) The variance - covariance matrix and explain the entries in it **[7 marks]**

(ii) Variance of the portfolio **[7 marks]**

(i) Spot an arbitrage **[5 marks]**

(ii) Determine how much profit the investor would get in that situation **[2 marks]**

(c) Differentiate between the following terms

(i) Asset return and portfolio return **[3 marks]**

(ii) Expected asset return and expected portfolio return **[3 marks]**

(iii) The table below indicates two economic conditions ω_1 and ω_2.

Scenario	Probability	Return K_1	Return K_2
ω_1	0.25	-2%	-4%
ω_2	0.75	8%	x

Determine the return ω_2 in the other scenario such that the two securities have the same risk. **[6 marks]**

(d) Given that the original prices of a bond and a share of stock are £200 and £30 respectively. After one year the price of a bond is £250 while the price of stock was predicted to be £35 with a probability 0.6 or £25 with a probability of 0.4. Determine the return on an investment in bonds, stock and the portfolio comprising 50 stock shares and 20 bonds. **[6 marks]**

Question 6

(a) Briefly explain the following terms as used in investment

(i) One step Binomial model **[2 marks]**

(ii) Long forward contract **[2 marks]**

(iii) Short forward contract **[2 marks]**

(iv) Call option **[2 marks]**

(v) Put option **[2 marks]**