WOMEN'S UNIVERSITY IN AFRICA

Addressing gender disparity and fostering equity in University Education

FACULTY OF MANAGEMENT AND ENTREPRENEURIAL SCIENCES

BSc HONOURS DEGREE IN MANAGEMENT AND ENTREPRENEURIAL DEVELOPMENT STUDIES SPECIALISING IN BANKING & FINANCE/MANAGEMENT & MARKETING

BACHELOR OF ACCOUNTING SCIENCE HONOURS DEGREE

BSc HONOURS DEGREE IN HUMAN RESOURCE MANAGEMENT

BSc HONOURS DEGREE IN PURCHASING & SUPPLY CHAIN MANAGEMENT

MAIN PAPER

BM115: FINANCIAL MATHEMATICS

INTAKES 28& 13: FIRST YEAR FIRST SEMESTER

DATE: TIME: HOURS

INSTRUCTIONS TO CANDIDATES

Answer **Question 1** and any other **two** questions.

ADDITIONAL MATERIAL

Graph paper

Question 1

M & M (Pvt) Ltd, a small entity in the mining industry is involved in operations that result in the company having stocks of cash resources. The company has thus decided to create a portfolio of investments comprising of Agric notes, a debt instrument and ordinary of a company that is into telecommunications. The intended investments in Agric Notes is 60% and the remainder in ordinary shares. Forecasts have shown the following position possibilities in as far as scenarios and their chances of occurring as well as annual returns are concerned.

Scenarios	Probability	Return on Agric Notes ($)	Return on Ordinary Shares ($)
Booming Economy	0.3	25 000	10 000
Normal Economy	0.4	20 000	11 000
Depressed Economy	0.2	18 000	22 000
Recession	0.1	10 000	28 000

Required:

(a) Determine the annual expected return for each investment [8]

(b) Calculate the standard deviation and variance for each investment [12]

(c) Using your results from (a) and (b0 above, which investment is most attractive/ Justify your answer. [5]

Question 2

(a) Differentiate

(i) $y = 2x^3 + 3x^2 - 4x$ [3]

(ii) $y = ax^3 + bx^2$+c, wherea, b and c are $constants$. [3]

(iii)$y = (x^2 - x)^3$ [4]

(b) A company's revenue function R for selling Q items is given by:
$R = 900Q - 3Q^2$.

(i) Find the value of Q that maximises the revenue. [3]

(ii) Hence determine the maximum revenue [5]

(c) The number of units Q that an employee produces in a day is related to the number of hours, t since the start of day. Given that

$Q(t) = -t^3 + 6t^2 - 12t$, find the time at which the employee's efficiency is at maximum. [5]

(d) A cost function is given by $C = Q^2$ – 2Q +10, where Q is the quantity of units produced. Find the point of minimum cost. [5]

Question 3

a) Suppose you deposit \$10000 today in an account that pays simple interest of 20% per annum. How much will you have at the end of 3 years? [4]

b) \$1800 is invested at 6% per annum compounded semi-annually for 1-year. After the 1-year, the interest rate changes to 6.5% compounded quarterly. What is the value of the investment after a total investment period of three years [8]

c) A loan \$1000 is to be repaid at the end of 4 years. The repayment deposits are made at the end of each year. Interest is 8% per annum compounded annually. Draw up a sinking fund schedule. [13]

Question 4

(a) Evaluate the following integrals

(i) $\int(2x^6 - 5)dx$ [3]
(ii) $\int(mpx^6 - x^7)dx$ [3]
(iii) $\int(mx - m^2 + 2x^2)dm$ [6]
(iv) $\int(2x^2 - 4xp - x)dx$ [5]

(b) Find the discounted price if a discount of 12.5% is given on a cost price of \$5 620 [4]

(c) The selling price of a bed is \$2810. The seller gives a 10% discount for cash. What is the cash price? [4]

Question 5

(a) Tom has just won the lottery and decides to take the 20-year annuity option. The lottery commission invests his winnings in an account that pays 4.8% interest, compounded annually. Each year for those 20 years, Tom receives a cheque from lottery commission for \$250 000. What is the present value of Tom's winnings? (Notice that this would be the

amount that Tom would get if he chose the lump-sum option). What is future value of Tom's winnings (Total amount that Tom get over the 20-year period) [20]

(b) Given that:

$$A = \begin{pmatrix} 1 & -2 \\ 4 & 3 \end{pmatrix}\ ,\ B = \begin{pmatrix} 2 & 0 \\ 3 & -2 \end{pmatrix}$$

Find the value of:

(i) A + B [1]

(ii) 2A – B [2]

(iii) A^2 [2]

Question 6

(a) Given the following inequalities

$$3x + 2y \geq 36$$

$$3x + 5y \geq 45, where\ x \geq 0\ and\ y \geq 0$$

Graphically determine the optimal solution that minimise

$$Z = 3x + 5y$$ [25]

END