



(The University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

UNIVERSITY EXAMINATIONS

2016/2017 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE

OF

BACHELOR OF COMMERCE

COURSE CODE: BCO 102

COURSE TITLE: BUSINESS MATHEMATICS

DATE: WEDNESDAY 7TH DECEMBER 2016 TIME: 9.00-11.00AM

INSTRUCTIONS TO CANDIDATES

- Attempt question One and any other two questions
TIME: 2 Hours

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QUESTION ONE

- a) With the growth of internet service providers, a researcher decides to examine whether there is a correlation between cost of internet service per month (rounded to the nearest dollars) and degree of customer satisfaction (on a scale of 1-10 with a 1 being not at all satisfied and a 10 being extremely satisfied). The researcher only includes programs with comparable types of services. A sample of the data is provided below.

Dollars	Satisfaction
10	8
16	7
15	9
13	4
8	9
5	6
11	3
19	5
22	12
25	10

- i) Compute simple linear regression equation (8 mks)
- ii) Determine the strength of relationship between dependent variable and the independent variable (4mks)
- iii) Determine the dollars to be realized if the customer was over-satisfied at a scale of 12. (2 mks)
- iv) If 28 dollars were used what will be the level of satisfaction. (2 mks)
- b) Differentiate the following equations stating the rule applicable.
- i) $Y = (4x + 6)^8$ (1mks)
- ii) $Y = \frac{4x^3 + 2}{X^6}$ (1mks)
- iii) $Y = (2x^2 + 3x)(4x^3 + 2)$ (1 mks)
- c) Integrate the following functions
- i) $Y = \frac{2}{3}x^5 + 2x^3 + 2$ (1 mks)
- d) Alpha Bakers manufactures and sells Q units of bread per month. The firm has developed the following cost and price demand functions.
- Total cost (TC) = $19Q^2 - 1600Q + 800$
- Price (P) = $800 - Q$
- Required**
- i) How many units should the firm produce in order to break-even (3mks)
- ii) Determine the price per loaf (2 mks)

- iii) What is the possible profit realized by the manufacturer, if it maximum or minimum (5 mks)

QUESTION TWO

- a) Find the market equilibrium price and quantity if the demand equation is given by $p-3q=22$ and the supply equation $q^2+2p+4q=100$. Where p is the price and Q is the quantity of the commodity. Find the total revenue and market equilibrium price. (6mks)
- b) Firms A, B and C supplied 55,38, and 27 truck loads of stones and 12, 7 and 9 truck loads of sand respectively to a contractor. If the cost of stones and sand are Sh.1,400 and Sh.800 per truck load respectively. Find the total amount paid by contractor to each of these firms using matrix method. (6 mks)
- c) A customer deposits ksh250 every 3 months into a building society account that pays interest at a rate of 8% per annum convertible quarterly (i.e. compounded every 3 months). How much money will be in the account at the end of 10 years? (4 marks)
- d) A Wiseman put ksh 1500 at the end of every year in a child education trust when she turned three years old girl at the beginning of the year. If the amount is compounded annually at the rate of 2.5% how much will the child receive when she turns 18 years? (4 marks)

QUESTION THREE

A consumer survey among 5000 consumers of bread performed by competition authority of Kenya during the month of may 2014 revealed the following switching patterns. Among 1500 consumers from Broadway 600 shifted to Kenblest and 200 consumers shifted to Superloaf, the rest remained loyal to Broadway. Among 1800 consumers from Kenblest 300 consumers shifted to Broadway and 700 consumers shifted to Superloaf, the rest remained loyal to Kenblest. Among 1700 consumers from Superloaf 150 shifted to Broadway and 300 consumers shifted to Kenblest, the rest remained loyal to Superloaf.

Required

- i) Transition matrix representing the above switching patterns (3mks)
- ii) Respective market shares two months later (8mks)
- iii) Market share in the long-run (6mks)
- iv) Highlight three applications of a markovian process (3 mks)

QUESTION FOUR

Consider an economy consisting of three sectors, Agriculture, manufacturing and services. The hypothetical flow of goods and services in physical units is summarized in the table below.

	Agriculture	Manufacturing	Services	Final Demand
Agriculture	60	180	0	120
Manufacturing	30	60	30	180
Services	0	40	10	100

- i) Determine the technological matrix. (2mks)
- ii) Determine the total output from the three sectors. (12mks)
- iii) Distribute the output above among the users in the economy. (6mks)

QUESTION FIVE

- a) An investment costs t80000 and has a scrap value of t20, 000. Its string of income before depreciation and taxation from the first year through the fifth year is as follows

Year	Returns
1	40,000
2	35,000
3	36,000
4	40,000
5	46,000

Assume 30% tax rate and depreciation is given as t10, 000 on a straight line basis. Required rate of return is 11%.

Required

- i) Compute the Net Present Value. (5mks)
 - ii) Compute the internal rate of return (7mks)
 - iii) Advise the management on the viability of the above investment based on the two criteria. (2mks)
- b) A hypothetical two sector economy has the following input – output relationship technological matrix

		User	
		A	B
Producer	P	0.3	0.2
	Q	0.1	0.4

Suppose final demand for a particular planning period is estimated as Ksh 4500 for sector P and Ksh 1800 for Sector Q.

- i) Determine the level of output required for each sector so that both intermediate demand and final demand is satisfied (3mks).
- ii) Distribute the output among the users (3 mks)