JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF BUSINESS & ECONOMICS

UNIVERSITY EXAMINATION FOR MASTER OF BUSINESS ADMINISTRATION

FIRST YEAR SEMESTER ONE

MAIN CAMPUS

COURSE CODE: MBA 805

COURSE TITLE: QUANTITATIVE METHODS

EXAM VENUE: CL 1 **STREAM: MBA**

DATE: 22/12/2017 **EXAM SESSION: 2:00-5:00**

TIME: 3 HOURS

INSTRUCTIONS:

1. **Answer ANY FOUR questions in this question paper**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE

a) A movie theatre charges sh.80 for each adult admission and sh.50 for each child. One Saturday, 525 tickets were sold, bringing in a total of 32,550.How many of each type of ticket were sold? (Use matrix method) (4mks)

b) Differentiate $\dfrac{x^3}{3x+7}$ (4mks)

c) Describe any four areas of application of Markov analysis (4mks)

d) One half of a country's population lives in the city and one half in the suburbs. There is an 80% chance that a suburban resident will remain in the surburbs and a 20% chance that he or she will move to the city within the next month. A city dweller has a 50-50% chance of staying in the city or moving to the suburbs. Determine:

a) The percentage of the population who will be in the suburb and the city one and two months from now. (2mks)
b) The steady state probabilities (2mks)

e) In a post office, three clerks are assigned to process incoming mail. The first clerk, B_1, process 40 per cent, the second clerk, B_2,processes 35 per cent and the third clerk, B_3 processes 25 per cent of the mail. The first clerk has an error rate of 0.04, the second has an error rate of 0.06 and the third has an error rate of 0.003.A mail selected at random from a day's output is found to have an error. The Post Master wishes to know the probability that the mail was processed by the first, second, or third clerk, respectively (6mks)

f) Given the matrices

A = $\begin{bmatrix} 5 & 4 \\ 2 & 1 \end{bmatrix}$ B= $\begin{bmatrix} 3 & -2 \\ 5 & -3 \end{bmatrix}$ and C= $\begin{bmatrix} 5 & 1 & 1 \\ 6 & 2 & 4 \end{bmatrix}$

Calculate:

$(B\ C)^T$ (5mks)

g) Find the area bounded by the graphs of f (x) =1/2x+3, g (x) =-x^2+1, x=-2 and x =1 (3mks)

QUESTION TWO

a) Nyamongo Limited has the following demand function for product N

Demand function: $P=300-Q^2$

Where p= price per unit

Q= Quantity produced and sold

Determine:

i) Quantity that will maximize revenue (4mks)

ii) Price that will maximize revenue (4mks)

iii) Maximum total revenue (2mks)

b) An economy consists of three interdependent sectors; Energy, Transport and Manufacturing. The flow of inputs and outputs between the industries is represented in the table below.

	Inputs (Tonnes)			Final demand
Output (Tonnes)	Energy	Transport	Manufacturing	
Energy	20,000	32,500	37,500	10,000
Transport	30,000	65,000	37,500	30,000
Manufacturing	40,000	32,500	12,500	40,000

Required:

i) The technical coefficient matrix (3mks)

ii) The Leontiff inverse matrix (7mks)

QUESTION THREE

a) Solve by matrix algebra (10mks)

$$X + 2y + 3z = 3$$

$$2x + 4y + 5z = 4$$

$$3x + 5y + 6z = 8$$

b) Continental Corporation operates a large fleet of cars for which an extensive preventive maintenance program is utilized. The cars can be classified in one of the three states: Good (G), Fair (F) and Poor (P). The transition matrix of these cars is as follows:

FROM \ TO	G	F	P
G	0.6	0.3	0.1
F	0.2	0.6	0.2
P	0.1	0.4	0.5

Required:

i) Assume that currently there are 100 cars in good shape, 60 in fair shape and 20 in poor shape. How many cars will be found in each condition next week? (5mks)

ii) How many cars will be found in each condition once the process stabilizes? (5mks)

QUESTION FOUR

a) A fast food chain has three shops A ,B and C .The average daily sales and profit in each shop is given in the following table.

	Units sold			Unit profit		
	Shop A	Shop B	Shop C	Shop A	Shop B	Shop C
Burger	800	400	500	20 p	40 p	33 p
Chips	950	600	700	50 p	45 p	60 p
Drinks	500	1200	900	30 p	35 p	20 p

Use matrix multiplication to determine,

i) The profit for each product (5mks)

ii) The profit for each shop (5mks)

b) A refrigerator manufacturer can sell all the refrigerators of a particular type that he can produce. The total cost (£) of producing (q) refrigerators per week is given by 300q + 2000 .The demand function is estimated as 500 – 2q

i) Derive the revenue function (2mks)

ii) Obtain the total profit function (2mks)

iii) How many units per week should be produced in order to maximize profit? (2mks)

iv) Show that the solution of the equation $\frac{\delta R}{\delta x} = \frac{\delta c}{\delta x}$ Where C represents the cost function, gives the same value for q as in part (iii) (2mks)

(v) What is the maximum profit available (2mks)

QUESTION FIVE

a) Find the following

(i) $\int \left(4x2 + \frac{1}{2}x - 3\right) dx$ (3mks)

(i) $\int (x\frac{3}{4} + \frac{3}{7}x - \frac{1}{2}$ +x2) dx (3mks)

(d) Find $\frac{\partial y}{\partial x}$ for 3x2(4x3 +x2) (4mks)

b) A company has a flick of vehicles and is trying to predict the annual maintenance cost per vehicle. The following data have been supplied for a sample of vehicles.

Vehicle Number	Age in years (X)	Maintenance cost P.a(Y) £×10
1	2	60
2	8	132
3	6	100
4	8	120
5	10	150
6	4	84
7	4	90
8	2	68
9	6	104
10	10	140

Required:

a) Using the least squares techniques, calculate the values of **a** and **b** in the equation y= a+ bx to allow managers to predict the likely maintenance cost, knowing the age of the vehicle. Estimate the maintenance cost of a 12 – year old vehicle (10mks)