



Machakos University College

(A Constituent College of Kenyatta University)

UNIVERSITY EXAMINATIONS 2013/2014

SCHOOL OF COMPUTING AND APPLIED SCIENCES

SECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

IN COMPUTER SCIENCE

BMS 102: MANAGEMENT MATHEMATICS II

DATE: MONDAY 7TH APRIL, 2014

TIME: 8.30 a.m. – 10.30 a.m.

INSTRUCTIONS:

Answer question **ONE** which is Compulsory and any other **TWO** questions

QUESTION ONE

(a) (i) Explain the meaning of the following terms

- (i) Transition Matrix
- (ii) Transient analysis
- (iii) Slack variable
- (iv) An event

(4 marks)

(ii) Given that $A = \begin{bmatrix} 2 & 2 \\ 3 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 1 \\ 3 & 4 \end{bmatrix}$, $C = \begin{bmatrix} 3 & 1 \\ 2 & 2 \end{bmatrix}$

Show that

- (i) $(A + B)^T = A^T + B^T$
- (ii) $(AB)^T = B^T A^T$
- (iii) $(ABC)^T = C^T B^T A^T$

(6 marks)

(b) A firm produces two products A and B with a contribution of sh.16 and sh.20 per unit respectively. The production data (per unit) are as follows:

	Labour	Material x (Units)	Material y (Units)
A	6	8	12
B	10	4	16

There are 1000 labour hours available for production. The materials available are 700 units and 1600 units of material x and y respectively.

- (i) Formulate a linear programming model. (5 marks)
- (ii) Solve using simplex for the optimal solution. (5 marks)

- (c) (i) State and the TWO types of modes used in construction of decision trees analysis. (4 marks)
- (ii) 1. Define the term economic ordering quantity (EOQ). (2 marks)
- 2. The following data relate to a given stock item

Normal usage	1300 per day
Minimum usage	700 per day
Maximum usage	2000 per day
Lead time	15-20 days
EOQ	20,000

Calculate the various control stock levels. (4 marks)

QUESTION TWO

- (a) (i) State any TWO requirements of a linear programming problem. (2 marks)
- (ii) State and explain the THREE characteristics (parts) of a formulation of a linear programming model. (6 marks)
- (b) During the month of June 2010, the market shares for two mobile phone companies x and y were 60% and 40% respectively. The table below shows a stable transition matrix.

	X	Y
X	0.7	0.3
Y	0.2	0.8

- (i) Interpret the values of 0.2 along the X column and 0.3 along the x row of the transition matrix. (2 marks)
- (ii) Determine the market shares in the month of August 2010. (3 marks)
- (iii) Determine the long run equilibrium market share. (7 marks)

QUESTION THREE

- (a) State and explain THREE assumptions of input – output model. (6 marks)
- (b) Suppose an economy has 3 industries x, y, z and each produces a single product. The output and consumption is as follows:

	TO				
FROM	X	Y	Z	Consumer Demand	Total Output
X	50	50	50	50	200
Y	30	30	20	70	150
Z	20	20	30	50	120

Assume that the consumer vector changes from (50, 70, 50) to (70, 90, 80) for x, y, and z respectively. Determine the new total output for the industries so as to meet the project demand.

(14 marks)

QUESTION FOUR

(a) (i) Simplify the following

$$\frac{n!}{(n-r)!r!} + \frac{n!}{(n-r+1)!(r-1)!} \quad (4 \text{ marks})$$

(ii) A candidate applies for a job in company A and B. The probability of being selected in company A is 0.7 and being rejected in company B is 0.5. The probability of at least one of his applications being rejected is 0.6. Determine the probability that he will be selected in one of the firm. (5 marks)

(b) A company makes three types of security locks A, B, and C, each of which requires culling assembly and finishing. Each unit of A requires 2 hours for cutting, 1 lock for assembly, and 3 hours for finishing; each unit of B requires 1 hour for cutting, 2 hours for assembly and 1 hour for finishing; each unit of C requires 1 hour for cutting, 2 hours for assembly and 3 hours for finishing. Available machine resources provide exactly 10 hours for cutting, 14 hours for assembly and 18 hours for finishing each week.

(i) Use the information provided to form a system of simultaneous equations (3 marks)

(ii) Apply Cramer's rule to calculate the number of locks of each type produced given that there is optimum utilization of machine time at the factory in a week. (9 marks)

QUESTION FIVE

(a) A manager has a choice between:-

- (i) A risky contract promising sh.7 million with probability 0.6 and sh.4 million with probability 0.4 and
- (ii) A diversified port folio consulting of two contracts with independent outcomes each promising sh.3.5 million with a probability 0.6 and sh.2 million with probability o.4.

Construct a decision tree hence advice the manager what project to choose. (8 marks)

(b) A company has 3 products A, B and C to launch in the market. An analysis of their probable acceptance has been carried out and the profits estimated as follows:

Product Acceptance	Acceptance Probability	Profit in sh."000" Product type		
		A	B	C
Excellent	0.2	60	100	20
Moderate	0.5	40	60	80
Poor	0.3	20	0	-40

- (i) Determine which product should be introduced to the market using:
 - I. Maximum expected profit approach (4 marks)
 - II. The maximum decision criterion (4 marks)
- (ii) In the context of this question outline briefly the limitations of the two decision criteria used. (2 marks)
- (iii) What would be the value of knowing the model acceptance level before making the decision on which model to produce? (2 marks)