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2913/204

QUANTITATIVE TECHNIQUES

November 2021

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**DIPLOMA IN SUPPLY CHAIN MANAGEMENT
DIPLOMA IN BUSINESS MANAGEMENT
DIPLOMA IN INFORMATION SCIENCE
DIPLOMA IN ENTREPRENEURSHIP
DIPLOMA IN HUMAN RESOURCE MANAGEMENT**

MODULE II

QUANTITATIVE TECHNIQUES

3 hours

INSTRUCTIONS TO CANDIDATES

This paper consists of SEVEN questions.

Answer any FIVE questions in the answer booklet provided.

All questions carry equal marks.

Candidates should answer the questions in English.

This paper consists of 7 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

1. (a) The probability that a train arrives on time at terminus A is $\frac{5}{6}$ while the probability that it arrives on time at terminus B is $\frac{3}{4}$.

Determine the probability that the train arrives:

- (i) on time at both terminus A and B;
- (ii) on time in one of the terminals;
- (iii) late at both terminals.

(8 marks)

- (b) Mwamba Limited intends to invest in a project. The following are the activities, preceding activities and durations of the project.

Activity	Preceding Activity	Duration (weeks)
A	—	7
B	—	10
C	A	4
D	A	30
E	A	7
F	B, C	12
G	B, C	15
H	E, F	11
I	E, F	25
J	E, F	6
K	D, H	19
L	G, J	25
M	K, I, L	2

- (i) Draw a network diagram of the project.
- (ii) Determine:

- I. critical path;
- II. project duration.

(12 marks)

2. (a) Explain the meaning of each of the following components of a time series:

- (i) trend;
- (ii) seasonal variation;
- (iii) cyclical variation;
- (iv) random variation.

(8 marks)

- (b) The following information shows the advertising costs and the respective sales revenue of Mika Enterprises for six consecutive periods.

Advertising costs (x)	Sales revenue (y)
Ksh	Ksh
2100	13,600
2800	15,800
2200	14,500
3000	16,200
2600	14,900
2500	15,000

- (i) Calculate the:
- Pearson's coefficient of correlation;
 - Coefficient of determination.
- (ii) Interpret the results obtained in (II) above. (12 marks)
3. (a) Mjengo Limited manufactures two products, P and Q using machines A, B and C. Product P requires 2 minutes of machine A, 3 minutes of machine B and 1 minute of machine C. Product Q requires 3 minutes of machine A, 2 minutes of machine B and 1 minute of machine C.
- The capacity available per week for each machine is 1500, 1500 and 600 for A, B and C respectively. The profit per unit of products P and Q is Ksh 10 and Ksh 12 respectively.
- Formulate a linear programming model from the information above.
 - Using graphical method, determine the weekly production that maximizes profit. (12 marks)
- (b) Explain four roles of quantitative techniques in business decision making (8 marks)
4. (a) Moses bought 2 vests and 3 shirts from a shop and paid a total of Ksh 3,100. Mohammed bought 3 similar vests and one similar shirt from the same shop and paid a total of Ksh 2,200. Using matrices, determine the price of:
- one vest;
 - one shirt. (8 marks)
- (b) Distinguish between each of the following terms as used in probability theory:
- dependent events and independent events;
 - permutations and combinations;
 - compound events and mutually exclusive events. (12 marks)

5. (a) Panda Limited produces and sells product kx. The average price (P) and total cost (TC) functions are as follows:

$$P = 200 - 8Q$$

$$TC = Q^2 - 16Q$$

Where Q is the number of units produced and sold.

Determine the:

- (i) total revenue (TR) function;
- (ii) number of units that maximizes profit;
- (iii) number of units that maximizes revenue;
- (iv) maximum profit.

(10 marks)

- (b) Matemtu Limited used material V20 in its production process. The annual demand is 2000 units.

The following details relate to the material.

Cost per unit Ksh 5

Ordering cost per order Ksh 500

Annual carrying cost per unit Ksh 200

Number of working days in a year 300.

Determine the:

- (i) Economic Order Quantity (EOQ);
- (ii) number of orders to be placed in one year;
- (iii) time interval between orders;
- (iv) total inventory cost.

(10 marks)

6. (a) Tom deposited Ksh 150,000 in an account paying compound interest at the rate of 10% per annum for four years.

- (i) Calculate the:
 - I. amount in his account at the end of the fourth year;
 - II. interest earned at the end of the fourth year.
- (ii) Peter wanted to have the same amount as in (I) above by depositing a certain sum of money in an account for a period of 3 years at a compound interest rate of 10% per annum.

Calculate the amount to be deposited in the account at the beginning of the three year period.

(10 marks)

- (b) The manager of Pona Pharmaceuticals Limited claims that the average content of medicine in a bottle is 0.5 litres. A random sample of 100 bottles is selected and the mean content is found to be 0.45 litres with a standard deviation of 0.10 litres.

Test the manager's claim at 5% level of significance. (10 marks)

7. (a) Explain the meaning of each of the following terms as used in network analysis:

- (i) dangling activity;
- (ii) loop;
- (iii) slack;
- (iv) dummy activity.

(8 marks)

- (b) The following table shows the prices and quantities of three commodities for the years 2010 and 2016.

Commodity	2010		2016	
	Price (Ksh)	Quantity (units)	Price (Ksh)	Quantity (units)
Bread	65	20	135	30
Sugar	95	8	160	7
Rice	150	5	320	8

- (i) Calculate:

- I. Laspeyre's price index;
- II. Paasche's price index;
- III. Fisher's ideal price index.

- (ii) Interpret the result in (III) above.

(12 marks)