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QUANTITATIVE TECHNIQUES

July 2017

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**DIPLOMA IN SUPPLIES CHAIN MANAGEMENT
DIPLOMA IN BUSINESS MANAGEMENT
DIPLOMA IN HUMAN RESOURCE MANAGEMENT**

QUANTITATIVE TECHNIQUES

3 hours

INSTRUCTIONS TO CANDIDATES

Answer any FIVE of the following SEVEN questions in the answer booklet provided.

All questions carry equal marks.

Candidates should answer the questions in English.

This paper consists of 5 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) Explain **four** limitations of linear programming in business decision making. (8 marks)
- (b) A manufacturing firm has three production techniques; 1, 2 and 3. The following data shows the number of units produced by ten selected workers under each technique.

Number of items produced per day			
Worker	Technique 1	Technique 2	Technique 3
A	40	60	55
B	50	86	65
C	55	40	40
D	60	59	42
E	63	62	85
F	57	85	70
G	42	90	73
H	69	42	47
I	80	55	90
J	44	46	64

The firm intends to select a combination of two production techniques that are most efficient.

- (i) Determine the Spearman's Rank correlation coefficient for each combination of two techniques.
- (ii) Advise the management on the most efficient combination of production techniques. (12 marks)
2. (a) Explain **four** areas of application of quantitative techniques in business. (8 marks)
- (b) The following table shows the prices and quantities of five commodities in a market for the years 2010 and 2015.

Commodity	2010		2015	
	Price (Ksh)	Quantity (Units)	Price (Ksh)	Quantity (Units)
A	40	200	45	180
B	50	180	50	200
C	100	100	120	90
D	50	150	60	140
E	80	160	100	150

Determine:

- (i) Paasche's price index;
- (ii) Laspeyre's price index;
- (iii) Fischer's ideal price index;
- (iv) Interpret the results in (iii) above.

(12 marks)

3. (a) Explain the **four** components of a time series.

(8 marks)

- (b) Given the following matrices:

$$A = \begin{matrix} & 4 & 0 & 1 \\ f2 & -3 & 2 & p \\ & 1 & 4 & 1 \end{matrix}$$

$$B = \begin{matrix} & 4 & 4 \\ f2 & -1 & p \\ & 1 & 0 \end{matrix}$$

$$C = \begin{matrix} & 4 & 3 \\ c & 0 & 2 \\ & & m \end{matrix}$$

Determine:

- (i) $A \times B$;
- (ii) $B \times A$;
- (iii) $2C \times B$;
- (iv) A^{-1} .

(12 marks)

4. (a) Individuals prefer a shilling today compared to a shilling in future. Explain five reasons for this preference.

(10 marks)

- (b) The following are the average revenue (AR) and average cost (AC) functions of a firm.

$$AR = 100 - 0.5q$$

$$AC = 50 + 2q$$

where q is the level of output. Determine the:

- (i) profit function;
- (ii) level of output that will maximise profits;
- (iii) maximum profits.

(10 marks)

5. (a) Distinguish between each of the following terms as used in the test of hypothesis:

- (i) Type I error and Type II error;
- (ii) Z test and t-test;
- (iii) critical region and acceptance region.

(12 marks)

- (b) The number of defective items in a production line are normally distributed with a mean of 50 and a standard deviation of 5. Determine the probability that the number of defects in the production line will be:
- (i) greater than 45 units;
 - (ii) between 40 and 60 units;
 - (iii) greater than 65 units;
 - (iv) below 40 units.
- (8 marks)

6. (a) Explain **four** types of costs associated with holding stock in a manufacturing firm. (8 marks)

- (b) The following information relates to a project to be undertaken by a firm.

Activity	Preceding activities	Duration (days)
A	-	10
B	-	15
C	A	4
D	A	10
E	B	5
F	B	16
G	D	6
H	C, E	10
I	C, E	12
J	F, I	4
K	G, H, J	5

- (i) Draw a network diagram.

- (ii) Determine:

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

(12 marks)

7. (a) Explain **five** rules used when drawing network diagrams. (10 marks)
- (b) The annual demand for component DX in a manufacturing process is 50,000 units. The ordering cost is Ksh 500 per order. The purchase price of component DX is Ksh 400. The holding cost is 10% of the purchase price plus Ksh 160 per unit per annum. Determine:
- (i) the Economic Order Quantity (EOQ);
 - (ii) the average inventory; ~~the~~
 - (iii) number of orders per year;
 - (iv) total relevant costs associated with the inventory.
- (10 marks)

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