2922/204
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2927/204
QUANTITATIVE TECHNIQUES
November 2022
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN PROJECT MANAGEMENT
DIPLOMA IN MARITIME TRANSPORT LOGISTICS
DIPLOMA IN DISASTER MANAGEMENT

QUANTITATIVE TECHNIQUES

3 hours

INSTRUCTIONS TO CANDIDATES

This paper consists of SEVEN questions.
Answer any FIVE questions in the answer booklet provided.
Show all your working.
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.

Turnover

1. (a) Explain **five** ways in which quantitative techniques may be applied in business decision making.

(10 marks)

(b) The following are the ranks awarded by 3 judges to 10 employees in a performance contest:

Employee	Ranks Awarded		
	Judge 1	Judge 2	Judge 3
A	5	6	5
B	7	3	1
C	1	5	6
D	6	2	8
E	2	4	7
F	8	7	10
G	3	10	2
H	10	9	4
I	4	1	9
J	9	8	3

(i) Calculate the Spearman's rank coefficient of correlation for each pair of judges.

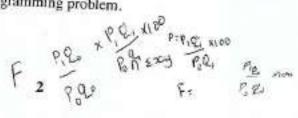(ii) Determine the most consistent pair of judges.

(10 marks)

2. (a) Explain **four** benefits of time series analysis in business decision making. (8 marks)

(b) A company manufactures two products; A and B. The two products pass through three machines; I, II and III. The following information relates to the two products and the three machines.

	Number of hours per unit		Available Number of hours
	A	B	
Machine I	5	2	1000
Machine II	3	2	900
Machine III	1	2	500
Profit per unit	100	40	

(i) Formulate the linear programming problem.

(ii) Using the graphical method:

Determine the:

(I) number of units of each product to be produced.

(II) maximum profit.

(12 marks)

7. (a) Given the following matrices:

$$A = \begin{pmatrix} 2 & -2 \\ 6 & 10 \end{pmatrix}, \quad B = \begin{pmatrix} 2 & 0 \\ 8 & -4 \end{pmatrix} \quad \text{and} \quad C = \begin{pmatrix} 6 & -7 \\ 8 & 3 \end{pmatrix}$$

Determine:

(i) $C^T - 3(B + \frac{1}{2}A)$

(ii) $(AB)^{-1}$

(iii) determinant of C.

(10 marks)

(b) The following are the prices and quantities of four commodities for the years 2014 and 2018.

Commodity	2014		2018	
	Prices (Ksh.)	Quantities (tonnes)	Prices (Ksh.)	Quantities (Tonnes)
A	20	200	25	180
B	40	150	50	120
C	50	200	75	150
D	100	320	120	280

Calculate the:

(i) Laspayre's quantity index;

(ii) Paasche's quantity index;

(iii) Fisher's ideal quantity index.

(10 marks)

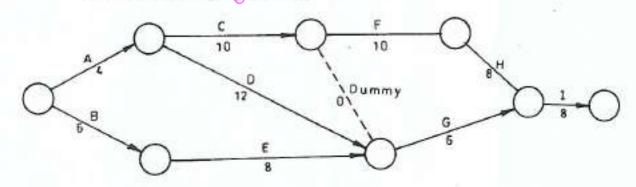8. (a) The following information shows the profits made by a company in millions of shillings for 10 consecutive years.

Year	Profit (Ksh. millions)
2004	20
2005	25
2006	22
2007	30
2008	60
2009	55
2010	90
2011	85
2012	100
2013	120

(i)   Using the least squares method, determine the trend line equation.

(ii) Using the equation in (i) above, estimate the profit of the company for the year 2020.

(10 marks)

(b) The following is a network diagram of a project to be undertaken by a company. The activity durations are given in weeks.

(i)   Prepare a precedence table showing activity, preceding activities and activity duration.

(ii) Determine the:

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

(10 marks)

5.   (a)   Describe the steps followed in the test of a hypothesis.   (10 marks)

    (b)   At Kendu Limited, 30% of the employees have a degree qualification. A random sample of 10 employees was selected from the company. Determine the probability that:

        (i)   **three** employees had a degree qualification;

        (ii)   no employee had a degree qualification;

        (iii)   at least **one** employee had a degree qualification;

        (iv)   at most **two** employees had a degree qualification.

                    (10 marks)

6.   (a)   Explain five categories of inventories that may be held by a firm.   (10 marks)

    (b)   The following is the Marginal Revenue (MR) function of a firm.

$$MR = 160 - 0.2q;$$

        where q is the level of output sold. Determine the:

        (i)   total revenue function;
        (ii)   average revenue function;
        (iii)   level of output that will maximize total revenue;
        (iv)   maximum total revenue;
        (v)   price at maximum total revenue.

                    (10 marks)

7.   (a)   Explain five limitations of index numbers.   (10 marks)

    (b)   Joshua has received terminal benefits amounting to Ksh 2,000,000. He is considering investing this amount for a period of 5 years under either of the following options:

Option I

Invest in a bank account paying compound interest at the rate of 14% per annum.

Option II

Invest in a mutual fund paying interest at the rate of 10% per annum, compounded semi-annually.

        (i)   Determine the amount in his account at the end of 5 years under each of the options.

        (ii)   Calculate the interest earned under each option.

        (iii)   Based on the results in (ii) above, advise Joshua on the option under which to invest.   (10 marks)

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