

2903/204 2926/204

2906/204

QUANTITATIVE TECHNIQUES

November 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**

*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 6 printed pages.**

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

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**Turn over**

- ✓ (a) Explain each of the following types of matrices giving an example in each case:
- null matrix;
  - rectangular matrix;
  - row matrix;
  - column matrix;
  - identity matrix.

(10 marks)

- (b) A logistics firm needs to determine the relationship between the age of its trucks and the maintenance costs. The information below relates to 10 trucks used by the firm.:

Truck	Age of truck in years (x)	Maintenance costs (Ksh 000's) (y)
A	4	25
B	5	30
C	6	35
D	10	45
E	2	20
F	1	10
G	0	5
H	11	24
I	12	50
J	6	30

- Determine the regression equation of maintenance cost on the age of the truck.
- Using the equation in (i) above, estimate the maintenance cost when the age of a truck is 8 years.

(10 marks)

2. (a) A company intends to launch a new product in the market.

The total revenue (TR) function is  $TR = -2000P^2 + 20,000P$ .

The total cost (TC) function is  $TC = -4000P + 50,000$ .

where P is the price of the new product.

Determine:

- the profit function;
- the optimal price level;
- maximum profit.

(10 marks)

(b) Explain **five** limitations of quantitative techniques in business decision making.  
(10 marks)

3. (a) Explain **five** factors that should be considered when constructing index numbers.  
(10 marks)

(b) Baraka Limited manufactures two products A and B using three types of raw materials X, Y and Z. The following information relates to the firm for the month of June 2016.

Products	Raw materials			Profit per unit
	X	Y	Z	
A	2	3	1	3
B	3	1	5	2
Total availability	18	9	10	

(i) Formulate the above as a linear programming problem.

(ii) Using graphical method determine:

(I) the number of units to be produced of each product in order to maximise profit;

(II) maximum profit.

(10 marks)

- ✓ 4. (a) Explain **four** possible areas of application of network analysis. (8 marks)
- (b) The data below shows the sales of a company for a period of 12 years.

Year	Sales (units)
1	20,000
2	40,000
3	60,000
4	50,000
5	50,000
6	60,000
7	80,000
8	100,000
9	120,000
10	110,000
11	165,000
12	80,000

- (i) Using three year moving averages, determine the trend values of the company's sales.
- (ii) Comment on the trend in (i) above. (12 marks)

- ✓ 5. (a) A service provider claims that emails from customers are responded to within 30 minutes. A sample of 100 emails from the customers were taken and were found to have an average response time of 35 minutes with a standard deviation of 10 minutes. Test the claim at 5% level of significance. (10 marks)
- (b) Explain **five** reasons that may lead to excess inventory in a firm. (10 marks)

- ✓ 6. (a) In a government office, 30% of the employees have a university degree. In a random sample of 10 employees, determine the probability that;
- (i) at least one has a university degree;
- (ii) 2 have a university degree;
- (iii) more than 8 have a university degree;
- (iv) at most 8 have a university degree. (12 marks)

- (b) A firm intends to undertake a project whose expected cash inflows for a period of six years are give in the table below:

Year	Cash inflows (Ksh)
1	15,000
2	20,000
3	25,000
4	40,000
5	55,000
6	100,000

The cost of capital is 10%.

Determine the present value of the expected cash inflows.

(8 marks)

- ✓ (a) The following information relates to material M2 used by TKD Limited in its manufacturing process:

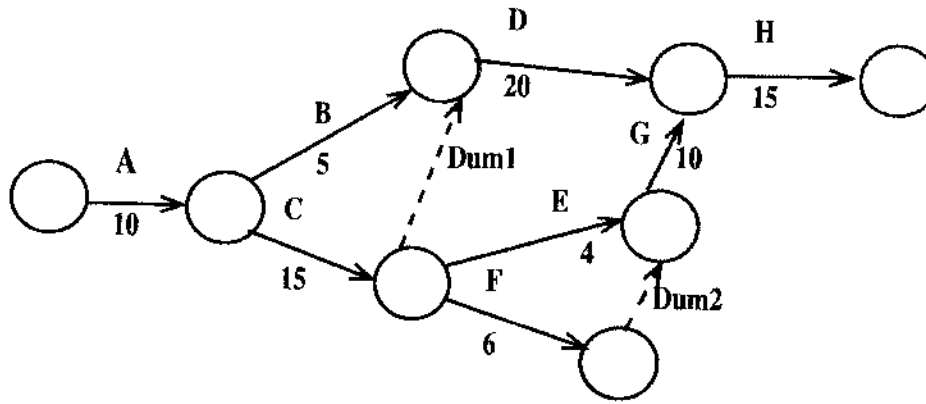
Maximum usage	5,000 units per week
Average usage	1,200 units per week
Minimum usage	1,000 units per week
Lead time	3-5 weeks
Re-order quantity	12,000 units
Buffer stock	2,000 units

Determine:

- (i) stock re-order level;
- (ii) maximum stock level;
- (iii) minimum stock level;
- (iv) safety stock level.

(10 marks)

(b) The following is the network diagram of a road construction project:



- (i) Prepare a table showing the activities preceding activities and the respective time duration.
- (ii) Using the network diagram above, determine:
  - (I) critical path;
  - (II) project duration.

(10 marks)

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