Name: _____ Index No: _____ / _____

2903/204 2922/204
2906/204 2925/204
QUANTITATIVE TECHNIQUES
July 2015
Time: 3 hours

Candidate's Signature: _____

Date: _____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN SUPPLY CHAIN MANAGEMENT
DIPLOMA IN BUSINESS MANAGEMENT
DIPLOMA IN PROJECT MANAGEMENT
DIPLOMA IN MARITIME TRANSPORT LOGISTICS

QUANTITATIVE TECHNIQUES

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.
Sign and write the date of examination in the spaces provided above.
*This question paper consists of **SEVEN** questions.*
*Answer any **FIVE** questions in the spaces provided in this question paper.*
All questions carry equal marks.
*Do **NOT** remove any pages from this booklet.*
Candidates should answer the questions in English.

For Examiner's Use Only

Question	1	2	3	4	5	6	7	TOTAL SCORE
Candidate's Score								

This paper consists of 20 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 information below shows the requirements for producing one unit of each of two products, A and B, at Kanga Textiles.

	Product	
	X	**Y**
Material (m^2)	5	2
Time (man hours)	3	4

The total cost of producing one unit of X is Ksh. 5,950 while the total cost of producing one unit of Y is Ksh. 4,200.

(i) Using matrices, determine the unit cost of:

I. material;
II. time.

(ii) The firm can hire labour services from an outsourcing firm at a cost of Ksh. 590 per hour. Advise the management on whether to hire the services or not.

(8 marks)

(b) The following functions relate to Unawesa Investments Limited.

$MR = 3,253 - 0.1q$

$TC = 0.2q^2 + 5,000,000$

Where:

MR - marginal revenue function

TC - total cost function

q - number of units sold

Determine the:

(i) profit function;

(ii) number of units to be produced and sold in order to maximise profit;

(iii) maximum profit.

(12 marks)

2. (a) Kijani Self Help youth group has identified a project that they can invest in five years' time. The group has a membership of 12. To meet their initial capital requirement, each member is required to deposit Ksh. 3,500 per month for the five years into the group's bank account. The bank pays a simple interest rate of 5% per annum on savings.

(i) Determine the capital requirement of the project;

(ii) If two members dropped out of the group before making any monthly contributions, determine the individual monthly contributions for each of the remaining members.

(8 marks)

(b) The following information was obtained from the records of Allan and Associates Limited concerning a certain printing paper:

Ordering cost per order	Ksh. 4,500
Purchase price per ream	Ksh. 350
Lead time	5 days
Demand per year	780 reams

Carrying cost per ream is 10% of purchase price

Determine the:

(i) Economic Order Quantity (EOQ);

(ii) re-order level;

(iii) total cost of inventory.

Assume a 250 working-day year.

(12 marks)

3. (a) The following are the prices and quantitites of four items purchased by a real estate company in the years 2010 and 2013.

	2010		2013	
Item	**Quantity**	**Price (Ksh.)**	**Quantity**	**Price (Ksh.)**
Light fixtures	6,900	850	5,400	980
Cement (50 kg bags)	13,000	740	11,500	810
Glass (m^2)	3,400	40	3,700	55
Bulbs (halogen)	8,500	560	4,000	700

(i) Calculate:

I. Laspeyre's price index;
II. Paasche's price index;
III. interpret the answers in (i) and (ii) above.

(12 marks)

(b) Explain each of the following terms as used in hypothesis testing.

(i) Null hypothesis;
(ii) Type II error;
(iii) Significance level;
(iv) Statistic.

(8 marks)

4. (a) Outline **four** uses of quantitative techniques in business. (8 marks)

(b) A firm packages its product into medium and deluxe packets for distribution. In a week, there is a total of 400 man hours available and a total of 3,000 m^2 of packaging material. The following information shows the requirements per packet.

	Type	
	Medium	**Deluxe**
Labour time (minutes)	15	40
Packaging material (m^2)	2	3

The cost of distribution is Ksh. 30 and Ksh. 45 for the medium and deluxe packets, respectively.

(i) Formulate a linear programming problem;

(ii) Using graphical method, determine the optimal number of medium and deluxe packets that will minimize distribution costs per week;

(iii) Calculate the minimum cost of distribution per week.

(12 marks)

5. (a) Define each of the following terms as used in network analysis:

(i) Event;
(ii) Critical path;
(iii) Dummy activity;
(iv) Total float.

(8 marks)

(b) (i) Explain each of the following terms as used in probability:

I. Mutually exclusive events;
II. Random experiment;
III. Probability distribution;
IV. Event.

(ii) The number of workers absent per working week in a road construction project is known to follow a Poisson distribution with a mean of 0.5. Determine the probability that in a particular week there will be:

I. less than 2 workers absent;
II. more than 2 workers absent.

(12 marks)

6. (a) The following data shows the population of a particular city over a period of 6 years.

Year	Population (millions)
2008	2
2009	4
2010	5
2011	7
2012	7
2013	8

Using the method of least squares, estimate the population of the city in the year 2014.
(10 marks)

(b) Two senior managers at a project consulting firm measured the performance of their 5 employees, in percentages, as shown in the table below.

Employee	Performance	
	Senior Manager I	Senior Manager II
A	59	60
B	61	58
C	70	74
D	39	41
E	58	60

(i) Calculate the Spearman's Rank Correlation Co-efficient;

(ii) Interpret the answer in (i) above.

(10 marks)

7. (a) Differentiate between each of the following terms as used in inventory control:

(i) Ordering costs and Holding costs;

(ii) Stock out and Safety stock;

(iii) Re-order level and Lead time.

(9 marks)

(b) The following are the activities relating to a community water project, and their duration in weeks.

Activity	Preceding Activities	Duration
A	-	2
B	A	9
C	-	1
D	A, C	5
E	B, D	3
F	A, C, E	8
G	F	10

(i) Draw a network diagram to represent the above information.

(ii) Determine the:

I. critical path;
II. expected project duration.

(11 marks)