Name:_____ Index No._____

2903/204
2906/204 Candidate's Signature:_____
2922/204
QUANTITATIVE TECHNIQUES Date:_____
November 2015
Time: 3 hours

KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN SUPPLY CHAIN MANAGEMENT
DIPLOMA IN BUSINESS MANAGEMENT
DIPLOMA IN PROJECT MANAGEMENT

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 paper consists of **SEVEN** questions.*
*Answer any **FIVE** questions in the spaces provided in this question paper.*
All questions carry equal marks.
Present Value table is attached.
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 18 printed pages.

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

Turn over

1. (a)   Explain **four** assumptions of a linear programming model.   (8 marks)

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(b)   The information below shows the activities to be carried out during a satellite communication dish installation project.

Activity	Duration (weeks)
0 - 1	4
0 - 2	6
0 - 3	11
1 - 4	3
1 - 6	8
2 - 4	2
3 - 5	7
4 - 6	1
5 - 6	3
6 - 7	10
7 - 8	4

(i)   Construct the project network diagram.
(ii)   Determine the

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

                                                          (12 marks)

easytvet.com

2.	(a)	Define each of the following terms:

(i)	Paasche's price index.
(ii)	Laspeyres price index.
(iii)	Fischer's ideal price index.
(iv)	index number.

(8 marks)

(b)	Explain **three** areas of application for each of the following quantitative techniques in decision making process:

(i)	linear programming.
(ii)	network analysis.
(iii)	inventory control.
(iv)	time series analysis.

(12 marks)

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3. (a) The following information relates to a certain raw material used in a local hotel:

Annual demand   3000 units
Price per item   Ksh 270
Ordering cost   Ksh 4,200 per order
Holding cost is 5% of item price, per year
Lead time   8 days
Working days in a year 365

Determine the:

(i) Economic Order Quantity (EOQ).
(ii) re-order point.
(iii) total cost.

(12 marks)

(b) The following information shows the number of kilometres covered by cars and the associated cost of maintenance for each car, in a car rental company.

Car	Kilometres covered	Maintenance costs (Ksh)
A	80,000	96,000
B	29,000	12,000
C	53,000	52,000
D	13,000	16,000
E	45,000	26,000

(i) Compute the regression equation of maintenance costs on kilometres covered.

(ii) Estimate the maintenance cost for a car that has covered 60,000 kilometres.

(8 marks)

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4. (a) The contents of 3 fruit baskets at Mama Awinja groceries are as follows:

   First basket   1 mango, 2 apples, 3 oranges
   Second basket   2 mangoes, 3 apples, 1 orange
   Third basket   3 mangoes, 1 apple, 2 oranges

   A fruit basket is picked at random and 2 fruits picked from it randomly, one at a time, without replacement. The two fruits picked were an apple and a mango. Determine the probability that the two fruits picked were from the second basket.

   (12 marks)

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(b) The following data shows the production of cement in millions of tonnes in a period of 10 years in ABC Cement Company.

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Production (million tonnes)	21	22	23	25	24	23	25	26	28	27

Using 3 - year moving averages, determine the trend values.   (8 marks)

5.   (a)   The price of a hair drier, in Kenya shillings, is defined by the function P = 2650 - 50q and the total cost is given by the function $TC = \dfrac{1}{400}q^2 + 150q + 20,000$; where q is the number of units produced. Determine the

(i)   profit maximising price.
(ii)   maximum profit.

(10 marks)

(b)   The information below shows the number of chairs and number of computers bought by Mary and Jane from the same shop.

	Number of chairs	Number of computers
Mary	1,500	4
Jane	1,340	6

The total amount paid by Mary and Jane was Ksh 936,500 and Ksh 581,250 respectively. Using the matrix method, determine the unit cost of one

(i)   chair.
(ii) computer.

(10 marks)

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6. (a) A particular company is expected to yield the following cash flows in the next 7 years, as shown in the table below:

Year	Cash Inflow (Ksh)
2015	6,380,000
2016	6,900,000
2017	4,980,000
2018	3,500,000
2019	2,700,000
2020	3,320,000
2021	1,750,000

An investor has offered to buy out the company at the start of January 2015, at a total price of Ksh 21,500,000. Using the present value approach, advise the owners of the company on whether to accept the offer. The discount rate is 8%.

(9 marks)

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(b) Two groups of students in colleges, A and B sat for the same examination. College A had 50 students and their mean grade was 75 with a standard deviation of 9. College B had 60 students and their mean grade was 79 with a standard deviation of 7. Test whether there is any significant difference in the performance of the two colleges at 5% level of significance. (11 marks)

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

   (i)   succeeding activity and preceding activity.
   (ii)   Programme Evaluation Review Technique (PERT) and Critical Path Method (CPM).
   (iii) earliest start time and earliest finish time of an activity.
   (iv)   merger events and burst events.

(8 marks)

(b) A firm has an annual demand of 100,000 units of a certain input material. The order cost per order is Ksh 2,000 and the carrying cost is 10% per annum of the purchase price per unit. The purchase price is Ksh 100 per unit. The firm has to chose between three order size options; 100,000, 50,000 or 25,000 units. Advise the management on the best order size option to adopt in order to minimize their costs.   (12 marks)

Table B: Present Value of an Annuity of Sh. 1 Per Period for n Periods:

$$PVIFA_{r,t} = \sum_{t=1}^{n} \frac{1}{(1+r)^t} = \frac{1 - \frac{1}{(1+r)^n}}{r}$$

Number of payments	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8696	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6901	1.6467	1.6257	1.6052	1.5656	1.5278	1.4568	1.3916	1.3315
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1065	1.9813	1.8684	1.7663
4	3.9020	3.8077	3.7171	3.6299	3.5460	3.4651	3.3872	3.3121	3.2397	3.1699	3.0373	2.9137	2.8550	2.7982	2.6901	2.5887	2.4043	2.2410	2.0957
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6048	3.4331	3.3522	3.2743	3.1272	2.9906	2.7454	2.5320	2.3452
6	5.7955	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6229	4.4859	4.3553	4.1114	3.8887	3.7845	3.6847	3.4976	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5824	5.3893	5.2064	5.0330	4.8684	4.5638	4.2883	4.1604	4.0386	3.8115	3.6046	3.2423	2.9370	2.6775
8	7.6517	7.3255	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6389	4.4873	4.3436	4.0776	3.8372	3.4212	3.0758	2.7860
9	8.5660	8.1622	7.7861	7.4353	7.1078	6.8017	6.5152	6.2469	5.9952	5.7590	5.3282	4.9464	4.7716	4.6065	4.3030	4.0310	3.5655	3.1842	2.8681
10	9.4713	8.9826	8.5302	8.1109	7.7217	7.3601	7.0236	6.7101	6.4177	6.1446	5.6502	5.2161	5.0188	4.8332	4.4941	4.1925	3.6819	3.2689	2.9304
11	10.3676	9.7868	9.2526	8.7605	8.3064	7.8869	7.4987	7.1390	6.8052	6.4951	5.9377	5.4527	5.2337	5.0286	4.6560	4.3271	3.7757	3.3351	2.9776
12	11.2551	10.5753	9.9540	9.3851	8.8633	8.3838	7.9427	7.5361	7.1607	6.8137	6.1944	5.6603	5.4206	5.1971	4.7932	4.4392	3.8514	3.3868	3.0133
13	12.1337	11.3484	10.6350	9.9856	9.3936	8.8527	8.3577	7.9038	7.4869	7.1034	6.4235	5.8424	5.5831	5.3423	4.9095	4.5327	3.9124	3.4272	3.0404
14	13.0037	12.1062	11.2961	10.5631	9.8986	9.2950	8.7455	8.2442	7.7862	7.3667	6.6282	6.0021	5.7245	5.4675	5.0081	4.6106	3.9616	3.4587	3.0609
15	13.8651	12.8493	11.9379	11.1184	10.3797	9.7122	9.1079	8.5595	8.0607	7.6061	6.8109	6.1422	5.8474	5.5755	5.0916	4.6755	4.0013	3.4834	3.0764
16	14.7179	13.5777	12.5611	11.6523	10.8378	10.1059	9.4466	8.8514	8.3126	7.8237	6.9740	6.2651	5.9542	5.6685	5.1624	4.7296	4.0333	3.5026	3.0882
17	15.5623	14.2919	13.1661	12.1657	11.2741	10.4773	9.7632	9.1216	8.5436	8.0216	7.1196	6.3729	6.0472	5.7487	5.2223	4.7746	4.0591	3.5177	3.0971
18	16.3983	14.9920	13.7535	12.6593	11.6896	10.8276	10.0591	9.3719	8.7556	8.2014	7.2497	6.4674	6.1280	5.8178	5.2732	4.8122	4.0799	3.5294	3.1039
19	17.2260	15.6785	14.3238	13.1339	12.0853	11.1581	10.3356	9.6036	8.9501	8.3649	7.3658	6.5504	6.1982	5.8775	5.3162	4.8435	4.0967	3.5386	3.1090
20	18.0456	16.3514	14.8775	13.5903	12.4622	11.4699	10.5940	9.8181	9.1285	8.5136	7.4694	6.6231	6.2593	5.9288	5.3527	4.8696	4.1103	3.5458	3.1129
25	22.0232	19.5235	17.4131	15.6221	14.0939	12.7834	11.6536	10.6748	9.8226	9.0770	7.8431	6.8729	6.4641	6.0971	5.4669	4.9476	4.1474	3.5640	3.1220
30	25.8077	22.3965	19.6004	17.2920	15.3725	13.7648	12.4090	11.2578	10.2737	9.4269	8.0552	7.0027	6.5660	6.1772	5.5168	4.9789	4.1601	3.5693	3.1242
40	32.8347	27.3555	23.1148	19.7928	17.1591	15.0463	13.3317	11.9246	10.7574	9.7791	8.2438	7.1050	6.6418	6.2335	5.5482	4.9966	4.1659	3.5712	3.1250
50	39.1961	31.4236	25.7298	21.4822	18.2559	15.7619	13.8007	12.2335	10.9617	9.9148	8.3045	7.1327	6.6605	6.2463	5.5541	4.9995	4.1666	3.5714	3.1250
60	44.9550	34.7609	27.6756	22.6235	18.9293	16.1614	14.0392	12.3766	11.0480	9.9672	8.3240	7.1401	6.6651	6.2482	5.5553	4.9999	4.1667	3.5714	3.1250

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