KASNEB

CPA PART II SECTION 4

CIFA PART II SECTION 4

CCP PART II SECTION 4

QUANTITATIVE ANALYSIS

FRIDAY: 27 May 2016. **Time Allowed: 3 hours.**

Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.

QUESTION ONE

(a) Explain four differences between the project evaluation and review technique (PERT) and the critical path analysis (CPA). (8 marks)

(b) *A certain audit firm has two categories of employees, auditors and assistant auditors. The total monthly salary of* 1 auditor and 5 assistant auditors amount to Sh.456,755 whereas the total monthly salary of 3 auditors and 9 assistant auditors amount to Sh.985,005. The firm has a total of 6 auditors and 14 assistant auditors. The employees contribute 12 per cent of their monthly salaries towards their sacco society.

Required:

(i) The monthly salary of an auditor and an assistant auditor, using matrix algebra. (4 marks)

(ii) The employees' total monthly contribution towards their sacco society. (1 mark)

(c) Shujaa Limited deals in the manufacture of a product named "Zed". The product "Zed" is produced on order and the company does not keep inventory of the product. The demand and total cost functions (in thousands of shillings) of the company are given as follows:

$P = 190 - q$

and

$TC = q^2 + 10q + 500$

Where: P is the unit selling price.
q is the quantity demanded in units.
TC is the total cost.

Required:

(i) The maximum profit of the company. (6 marks)

(ii) The output level that would maximise total revenue. (1 mark)

(Total: 20 marks)

QUESTION TWO

(a) Distinguish between a "univariate function" and a "multivariate function". (2 marks)

(b) The mean weight of 500 packaging tins from a production process are normally distributed with a mean weight of 151 grammes and a standard deviation of 15 grammes.

Required:

(i) The number of packaging tins that weigh between 120 grammes and 155 grammes. (4 marks)

(ii) The number of packaging tins that weigh more than 185 grammes. (3 marks)

(c) The following data were obtained from the records of Kiwandani Limited for the year 2015:

Month	Total overhead cost (y) (Sh.)	Director labour hours (x)
January	16,250	1,056
February	15,000	736
March	15,000	840
April	14,500	800
May	15,250	880
June	15,750	1,008

Required:

(i) The least squares regression function relating direct labour hours and total overhead cost. (7 marks)

(ii) The coefficient of determination. Comment on your result. (4 marks)

(Total: 20 marks)

QUESTION THREE

(a) Explain the following terms as used in game theory:

(i) Pay-off. (1 mark)

(ii) Value of a game. (1 mark)

(b) Highlight eight steps followed in the simulation process. (8 marks)

(c) The table below shows the actual sales and target sales of eight sales agents for the year 2015 in millions of shillings.

Sales agent	1	2	3	4	5	6	7	8
Actual sales (y)	45	41	50	56	60	42	43	52
Target sales (x)	40	27	45	38	52	35	29	44

Required:

The Spearman's rank correlation coefficient. Interpret your result. (4 marks)

(d) A cashier at a departmental store can serve on average 24 customers per hour. The arrival rate of customers averages 20 customers per hour. The departmental store applies a single channel queuing system.

Required:

(i) The probability that the cashier is idle. (2 marks)

(ii) The average number of customers in the queuing system. (2 marks)

(iii) The average time a customer spends in the queue waiting to be served. (2 marks)

(Total: 20 marks)

QUESTION FOUR

(a) Viwanda Limited deals in the production of a product named "Nguvu". The production cost of the product is Sh.500 per unit (excluding packaging cost). The product is sold at Sh.1,000 per unit. The company is considering the purchase of one out of three different packaging systems. The cost data for the three packaging systems are as follows:

Packaging system	Purchase cost Sh. "000"	Variable cost per unit of product Sh. "000"	Scrap value Sh. "000"
A	100	1.50	10
B	200	1.00	20
C	400	0.50	40

All the three packaging systems have a useful life of one year after which they would be sold at their estimated scrap values. The probability distribution for the demand for product "Nguvu" is as provided below:

Demand (units)	Probability
100	0.3
200	0.6
400	0.1

Required:
Recommend the packaging system that should be purchased by Viwanda Limited. (8 marks)

(b) Farm Produce Limited is a producer and distributor of maize flour. The company owns milling plants in Eldoret, Nanyuki and Narok towns. The milling plants have not been able to meet the demand orders of the company's distribution offices located in Mombasa, Kisumu, Nairobi and Isiolo towns. The company is considering the construction of a new milling plant either in Nakuru town or Meru town, in order to expand its production capacity.

The data below relate to the company's production and demand requirements.

Milling plant	Monthly output (units)	Unit production cost (Sh.)
Eldoret	30,000	96
Nanyuki	12,000	100
Narok	28,000	104

Distribution office	Monthly demand (units)
Mombasa	20,000
Kisumu	24,000
Nairobi	30,000
Isiolo	18,000

Additional information:

1. The estimated unit production costs in Nakuru and Meru towns are Sh.98 and Sh.106 respectively.
2. The unit transportation costs (in shillings) from each milling plant to each distribution office are given as follows:

		To			
		Mombasa	Kisumu	Nairobi	Isiolo
From	Eldoret	64	36	52	58
	Nanyuki	56	52	44	32
	Narok	58	42	36	50

3. The estimated unit transportation costs (in shillings) from each of the proposed milling plants to each distribution office are as follows:

		To			
		Mombasa	Kisumu	Nairobi	Isiolo
From	Nakuru	60	46	40	52
	Meru	62	56	46	28

4. Assume that the construction of one of the proposed milling plants would satisfy the demand deficiency.

Required:
Using the Vogel's approximation method (VAM), advise the management of Farm Produce Limited on the best location to construct the milling plant. (12 marks)

(Total: 20 marks)

QUESTION FIVE

(a) Outline three differences between the normal distribution and the t-distribution. (3 marks)

(b) A certain project is expected to be completed within 18 weeks. The expected net revenue if the project is completed on time is Sh.1,120,000 but a penalty of Sh.484,000 will be imposed if the project is not completed on time. The cost of the project is Sh.459,000. The standard deviation of the project's duration is 2.08 weeks.

The table below is a summary of activities required to complete the project, the duration of the activities and their preceding activities.

Activity	Duration (weeks)	Preceding activity
A	5	-
B	2	-
C	4	-
D	2	B
E	5	B,C
F	7	C
G	6	A,D
H	3	G, D, E, F

Required:

(i) A network diagram of the project. (8 marks)

(ii) The float times of activities B and D. (2 marks)

(iii) The critical path of the project. (1 mark)

(iv) A 95 per cent confidence interval of the expected completion time of the project. (2 marks)

(v) The expected profit from the project. (2 marks)

(Total 15 marks)

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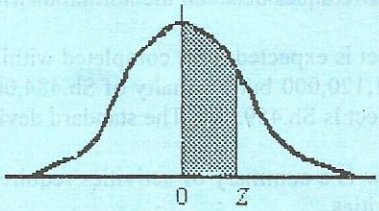
NORMAL CURVE

AREAS under the STANDARD NORMAL CURVE from 0 to z



z	0	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.201	.2051	.2088	.2123	.2157	.2190	.2224
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.45	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.25	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000

t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.999}$	$t_{.9995}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	[illegible]
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	[illegible]
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	[illegible]	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	[illegible]	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	[illegible]	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	[illegible]	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390
1000	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098	3.300
Z	0.000	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090	3.291
	0%	50%	60%	70%	80%	90%	95%	98%	99%	99.8%	99.9%
	Confidence Level										

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