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CPA PART II SECTION 4

CIFA PART II SECTION 4

CCP PART II SECTION 4

QUANTITATIVE ANALYSIS

FRIDAY: 30 November 2018.   **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 the following terms as used in decision theory:

(i)   Opportunity loss.   (1 mark)

(ii)   Expected value of perfect information.   (1 mark)

(b)   Outline three assumptions of the transportation model.   (3 marks)

(c)   A company operates under two departments, P and Q. Details relating to a sample of employees working in the two departments has been provided as follows:

	Department P	Department Q
Number of employees	29	24
Average monthly salary	Sh.260,000	Sh.310,000
Standard deviation	Sh.25,000	Sh.30,000

Required:
Determine whether there is any significant difference between the average monthly salaries of employees working in the two departments. (Use a significance level of 5 per cent).   (6 marks)

(d)   Bidii College offers three courses namely; Accounting, Computing and Driving. The college has a total population of 500 students. Data obtained from the college revealed the following:

329   Students were undertaking Accounting course.
186   Students were undertaking Computing course.
295   Students were undertaking Driving course.
83   Students were undertaking both Accounting and Computing courses.
217   Students were undertaking both Accounting and Driving courses.
63   Students were undertaking both Computing and Driving courses.

Required:
(i)   Present the above information in a Venn diagram.   (3 marks)

(ii)   The number of students undertaking all the three courses.   (4 marks)

(iii)   The number of students undertaking only one course.   (2 marks)
(Total: 20 marks)

QUESTION TWO
(a)   ABC Limited manufactures and sells electronic calculators whose marginal cost function is given by:

MC   =   x – 100 (in thousands of shillings)

Where: MC is the marginal cost function.
        x is the number of electronic calculators produced and sold.

The fixed cost of production amounts to Sh.250,000. The total revenue function is estimated to be quadratic in nature.

The table below shows the sales revenue realised by the company at three different production levels:

Number of electronic calculators produced and sold (x)	Sales revenue (Sh."000")
20	1,600
40	3,200
60	4,800

Required:

(i)   The total profit function.   (6 marks)

(ii)   The maximum profit.   (2 marks)

(b)   X Limited, Y Limited and Z Limited deal in the production of detergents. On 1 January 2017, the three companies introduced a similar new detergent in the market. Prior to introduction of the new detergent, the three companies had an equal share of the market. A survey conducted on the market shares of the three companies as at 31 December 2017 revealed the following:

1.   X Limited had retained 90 per cent of its customers but had lost 3 per cent and 7 per cent of its customers to Y Limited and Z Limited respectively.

2.   Y Limited had retained 75 per cent of its customers but had lost 10 per cent and 15 per cent of its customers to X Limited and Z limited respectively.

3.   Z Limited had retained 80 per cent of its customers but had lost 5 per cent and 15 per cent of its customers to X Limited and Y Limited respectively.

4.   There were no significant changes in the buying habits of the customers during the year.

Required:

(i)   The market shares of the three companies as at 31 December 2018.   (3 marks)

(ii)   The long run market shares of the three companies.   (9 marks)
                                                                                                (Total: 20 marks)

QUESTION THREE

(a)   Explain the following terms as used in hypothesis testing:

(i)   Level of significance.   (1 mark)

(ii)   Region of rejection.   (1 mark)

(b)   Summarise three factors that determine the size of the Pearson product moment correlation coefficient.   (6 marks)

(c)   The following data were obtained from the records of a certain company, relating to the year 2018:

Month	Total overhead costs – Y (Sh.)	Direct labour hours – X
January	14,250	856
February	13,000	536
March	13,000	640
April	12,500	600
May	13,250	680
June	15,750	808

Required:

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

(ii)   The coefficient of determination.   (4 marks)

(iii) Comment on the results obtained in (c) (ii) above.   (1 mark)
                                                                                                (Total: 20 marks)

QUESTION FOUR

The data below represent the number of students enrolled in a certain college over a four year period:

Number of students enrolled

Year	Quarter 1	2	3	4
2015	70	100	80	60
2016	50	40	120	80
2017	90	70	70	40
2018	60	100	130	-

Required:

(a) The adjusted seasonal component for each of the four quarters, using the multiplicative model. (12 marks)

(b) Estimate the enrollment of students in each of the four quarters of year 2019 using the simple least squares method. (8 marks)

(Total: 20 marks)

QUESTION FIVE

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

    (i) Mutually exclusive events. (1 mark)

    (ii) Independent events. (1 mark)

    (iii) Joint probability. (1 mark)

    (iv) Conditional probability. (1 mark)

(b) The manager of a certain project has identified the following information relating to the project:

Activity	Immediate predecessor (s)	Duration (weeks)	Probability
A	-	3	0.25
		4	0.50
		5	0.25
B	-	4	0.15
		5	0.30
		6	0.20
		7	0.20
		8	0.15
C	A	1	0.20
		3	0.65
		5	0.15
D	B, C	4	0.80
		5	0.20
E	D	3	0.15
		4	0.25
		5	0.25
		6	0.35
F	D	5	0.20
		7	0.80
G	E, F	2	0.50
		3	0.50

Required:

    (i) A network diagram for the project. (6 marks)
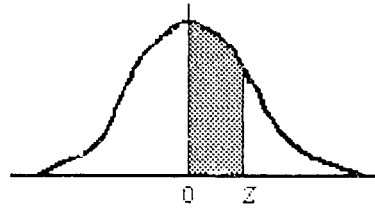
    (ii) The expected duration of the project. (2 marks)

    (iii) Simulate the durations of the project on the basis of two runs. (8 marks)

(Total: 20 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	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.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	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	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					