kasneb

CPA PART II SECTION 4

CIFA PART II SECTION 4

CCP PART II SECTION 4

QUANTITATIVE ANALYSIS

FRIDAY: 24 May 2019. **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) The marginal revenue and average cost functions of Biashara Limited are given as follows:

$MR = 40q - 3q^2$ (in Sh. million)

and

$AC = 2q - 10 + 25/q$ (in Sh. million)

Where: MR is the marginal revenue function.
q is the quantity of units produced and sold.
AC is the average cost function.

Required:

(i) The profit function. (2 marks)

(ii) The maximum profit. (4 marks)

(b) A salesman earns a fixed monthly basic salary and a commission that is directly proportional to the number of units sold in the month. During the months of February 2019 and March 2019, the salesman's total earnings were Sh.60,000 and Sh.70,000 respectively. The number of units sold by the salesman in the months of February 2019 and March 2019 were 100 and 250 respectively. During the month of April 2019, the salesman sold 400 units.

Required:

Using matrix algebra, determine:

(i) The fixed monthly basic salary of the salesman. (2 marks)

(ii) Commission earned per unit sold. (2 marks)

(iii) Total earnings of the salesman in the month of April 2019. (2 marks)

(c) A medium sized commercial bank has a clientele of 200 active customers. The bank operates three different types of accounts namely; current account, savings account and fixed deposit account. Information obtained from the bank indicates that:

- 84 customers operate savings accounts.
- 109 customers operate current accounts.
- 106 customers operate fixed deposit accounts.
- 45 customers operate both savings and current accounts.
- 36 customers operate both savings and fixed deposit accounts.
- 43 customers operate both fixed deposit and current accounts.

Required:

(i) Present the above information in a venn diagram. (3 marks)

(ii) The probability that a customer selected at random operates all the three types of accounts. (4 marks)

(iii) The probability that a customer selected at random operates only two types of accounts. (1 mark)

(Total: 20 marks)

QUESTION TWO

(a) Enumerate four assumptions of:

(i) A normal distribution. (4 marks)

(ii) A binomial distribution. (4 marks)

(b) A certain store has three cashiers serving customers at any given point in time. Each of the cashiers can serve on average 5 customers per hour. The arrival rate of customers averages 12 customers per hour.

Required:

The probability that there are no customers in the queuing system at a given point in time. (4 marks)

(c) A manufacturing company intends to introduce a new product into the market. Three products have been proposed namely; P_1, P_2 and P_3. The company can only introduce one of the three products. The following are the estimates of the probabilities and annual profits of the three products at three given states of demand, namely; high, moderate and low.

		Annual profit (Sh."000")		
State of demand	**Probability**	**P_1**	**P_2**	**P_3**
High	0.35	15,000	34,000	22,000
Moderate	0.40	25,000	30,000	15,000
Low	0.25	(5,000)	(3,000)	8,000

Required:

(i) A decision tree showing the payoff and expected monetary value of each alternative action. (6 marks)

(ii) Advise the management of the company on the best product to introduce into the market. (2 marks)

(Total: 20 marks)

QUESTION THREE

(a) Explain the following terms as used in network planning and analysis:

(i) Free float. (1 mark)

(ii) Total float. (1 mark)

(iii) Project crashing. (1 mark)

(b) (i) In relation to hypothesis testing and estimation, distinguish between "null hypothesis" and "alternative hypothesis". (2 marks)

(ii) Beta Limited deals in the manufacture of a detergent named "safi". A recent survey undertaken to determine the percentage of residents who use "safi" revealed that out of 500 residents selected at random, only 10% used "safi". In order to increase the usage of "safi" amongst the residents, the company undertook an advertising campaign that cost Sh.2.5 million. A survey undertaken after the campaign revealed that out of 600 residents selected at random, 15% used "safi".

Required:

Determine whether the advertising campaign increased the usage of "safi" amongst the residents. (Use a significance level of 5%). (5 marks)

(c) Two competing companies, A and B, that deal in the sale of computers, have an equal share of the market. Both companies intend to increase their market share through adoption of three different media of advertisement, namely: newspaper, radio and television. The payoff table for the two companies, showing the gain or loss of customers from adoption of the different media of advertisement is as shown below:

		Company B	
Company A	**Newspaper**	**Radio**	**Television**
Newspaper	40	50	-17
Radio	10	25	-10
Television	100	30	60

Required:

(i) The optimal strategies for companies A and B. (8 marks)

(ii) The value of the game. (2 marks)

(Total: 20 marks)

QUESTION FOUR

(a) Highlight two differences between "transportation" and "assignment" models of linear programming. (4 marks)

(b) Summarise three applications of shadow prices in decision making. (3 marks)

(c) The table below shows the number of years of experience of ten salespersons and the respective mean monthly sales realised by the salespersons.

Salesperson	Years of experience	Mean monthly sales (Sh.)
1	6	180,000
2	4	150,000
3	2	80,000
4	10	500,000
5	7	190,000
6	4	100,000
7	6	200,000
8	7	220,000
9	12	600,000
10	8	200,000

Required:

(i) The coefficient of correlation. Interpret your result. (7 marks)

(ii) Using ordinary least squares method, predict the mean monthly sales that would be realised by a salesperson having 15 years of experience. (6 marks)

(Total: 20 marks)

QUESTION FIVE

(a) Outline four merits of using the project evaluation and review technique (PERT) to plan and analyse a project in an organisation. (4 marks)

(b) A food processing company intends to install a computerised order processing system. The activities to be carried out during the installation of the system and their time estimates are given below:

	Time estimates (days)		
Activity	**Optimistic time**	**Most likely time**	**Pessimistic time**
A	7	17	27
B	5	11	23
C	3	8	19
D	23	31	45
E	9	21	39
F	9	11	25
G	2	5	14
H	9	10	17

The above time estimates were analysed using a computer and the results of the analysis were as follows:

Activity	Earliest start time (days)	Latest start time (days)	Earliest finish time (days)	Latest finish time (days)
A	0	0	17	17
B	17	17	29	29
C	29	43	38	52
D	29	29	61	61
E	38	52	60	74
F	61	61	74	74
G	61	79	67	85
H	74	74	85	85

Required:

(i) The expected completion time and variance of each of the activities. (8 marks)

(ii) The total float of each activity. (4 marks)

(iii) The expected completion time and variance of the project. (2 marks)

(iv) The 95% confidence interval for the project's completion time. (2 marks)

(Total: 20 marks)

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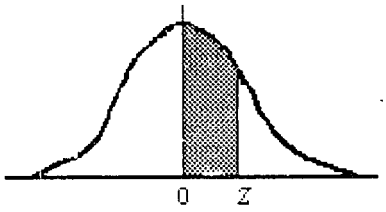
NORMAL CURVE

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
∞	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										