KASNEB

CIFA PART I SECTION 1

FINANCIAL MATHEMATICS

FRIDAY: 20 November 2015. **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) Outline four uses of time series analysis. (4 marks)

(b) The table below shows the sales of new cars by quarters during a period of four years:

Year	Quarter 1 Sh."million"	Quarter 2 Sh."million"	Quarter 3 Sh."million"	Quarter 4 Sh."million"
2011	40	64	124	58
2012	42	84	150	62
2013	46	78	154	96
2014	54	78	184	106

Required:

Forecasted sales for quarter 1 of 2015 using four-quarter moving averages. (4 marks)

(c) The marginal revenue of a company is given by the expression $MR = 40q - 3q^2$ while its average cost is given by the expression $AC = 2q + \frac{50}{q} - 10$, where q represents the number of units produced and sold by the company.

Required:

(i) The total revenue function. (2 marks)

(ii) The total cost function. (2 marks)

(iii) The total profit function. (2 marks)

(iv) The quantity which would maximise profit. (4 marks)

(v) The maximum profit. (2 marks)

(Total: 20 marks)

QUESTION TWO

(a) Describe four methods that might be used to calculate seasonal indices. (8 marks)

(b) The following data show the earnings per share (EPS) of a company at two different levels of debt and their probability distribution:

	Earnings per share (EPS) in shillings	
Probability	**25% debt**	**50% debt**
0.05	-0.25	-1.25
0.10	0.50	0.25
0.15	0.75	0.75
0.35	1.20	1.65
0.30	1.60	2.45
0.05	3.00	5.25

Required:

(i) The expected earnings per share at each level of debt. (2 marks)

(ii) The standard deviation of earnings per share at each level of debt. (6 marks)

(iii) The coefficient of variation at each level of debt. (2 marks)

(c) A commodity X has a linear demand function that passes through the following points:

Price (Sh.)	2,525	1,525
Quantity (units)	100	200

Required:
The demand function. (2 marks)

(Total: 20 marks)

QUESTION THREE

(a) A businessman bought 250 shares of company X and 375 shares of company Y for Sh.29,750. He also bought another 420 shares of company X and 295 shares of company Y with an additional cost of Sh.1,470 to his investment.

Required:
Using matrix algebra, determine the cost of a share in company X and company Y. (6 marks)

(b) Crown Contractors have summarised the relationship between transport costs and output units of the merchandise in their storage factory as shown in the data below:

Output ("000" units)	Transport costs (Sh."000")
22	37.6
26	43.5
20	58.9
14	30.6
22	38.9
31	48.0
26	35.4
23	39.2

Required:
(i) Using the least squares method, determine the equation of best fit. (6 marks)

(ii) The expected transport cost, if output is 18,000 units. (2 marks)

(c) Laika Ltd. manufactures electric cables. From historical data, the company realised a profit of Sh.12,580 after selling 10 cables and a profit of Sh.13,280 after selling 15 cables.

The profit function is quadratic in nature.

Required:
(i) The profit function. (4 marks)

(ii) The amount of profit realised if the company sold 18 cables. (2 marks)

(Total: 20 marks)

QUESTION FOUR

(a) Explain the difference between "mutually exclusive events" and "independent events". (2 marks)

(b) The mean weight of medium sized cakes in a bakery is 151 grammes with a standard deviation of 15 grammes.

The baking process is normally distributed. The process produces cakes in batches of 500.

Required:
(i) The number of cakes weighing between 120 grammes and 155 grammes. (4 marks)

(ii) The number of cakes weighing more than 185 grammes. (4 marks)

(iii) The number of cakes weighing less than 128 grammes. (4 marks)

(c) In a manufacturing company, 20% of a certain product produced by a machine are defective. Four units of the product are chosen at random.

Required:

(i) The probability that two units of the product are defective. (2 marks)

(ii) The probability that at most two units of the product are defective. (4 marks)

(Total: 20 marks)

QUESTION FIVE

(a) The table below shows the distribution of salaries of medical employees in two counties, P and Q in thousands of shillings:

Salaries (Sh. "000")	County P	County Q
94 - 98	20	15
98 - 102	50	45
102 - 106	120	133
106 - 110	170	184
110 - 114	140	155
114 - 118	60	75
118 - 122	30	25
122 - 126	10	18

Required:

(i) The mean medical salary of each county. (4 marks)

(ii) The median medical salary of each county. (4 marks)

(iii) The semi-interquartile range of medical salary of each county. (4 marks)

(iv) The modal medical salary of each county given that: mean - mode = 3 (mean - median). (2 marks)

(b) ABC Ltd. has borrowed a loan of Sh.3,200,000 for capital from a commercial bank. The loan is repayable at an interest rate of 12% per annum for seven years.

Required:

A loan repayment schedule. (6 marks)

(Total: 20 marks)

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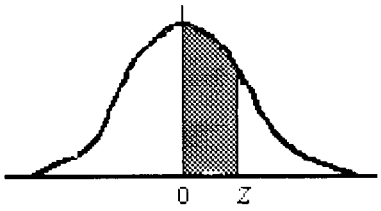
NORMAL CURVE

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