

**CIFA PART I SECTION I**  
**FINANCIAL MATHEMATICS**

**MONDAY: 21 May 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 how a finance manager might apply financial mathematics in performing any four of his/her functions in a company. (8 marks)
- (b) A wholesaler sells 760 articles at a total price of Sh.3,952,000. His profit is 25% on the cost of all the sold articles. The selling price per article is the same. After selling 20% of the articles, 10% of the articles were found to be defective with no resaleable value.

**Required:**

- (i) The total cost of all articles. (2 marks)
- (ii) The selling price per article. (2 marks)
- (iii) The number of articles the wholesaler must sell to make a profit of between Sh.305,760 and Sh.343,200. (Assume no defective articles have been found). (3 marks)
- (iv) The selling price of the remaining articles if the wholesaler was to earn the same profit on the cost price as before. (5 marks)

**(Total: 20 marks)**

**QUESTION TWO**

- (a) Summarise three key differences between correlation analysis and regression analysis. (6 marks)
- (b) The cost accountant of XYZ Ltd. wishes to use the budgeted expenditure to predict the actual expenditure on research and development.

The following data show expenditure incurred over an eight-year period where  $x$  is the budgeted expenditure in millions of shillings and  $y$  is the actual expenditure incurred in millions of shillings:

Year	1	2	3	4	5	6	7	8
Budgeted expenditure ( $x$ ) in Sh."million"	30	50	20	80	10	20	20	40
Actual expenditure ( $y$ ) in Sh."million"	50	80	30	110	20	20	40	50

**Required:**

- (i) The regression equation of  $y$  on  $x$ . (6 marks)
- (ii) Using the result obtained in (b) (i) above, predict the actual expenditure incurred in year 9 with a budgeted expenditure of Sh.15 million. (3 marks)

(c) The following probability distribution shows the payoffs of launching a product in a company:

Payoff (Sh. "million")	0	25	50	20
Probability	0.60	0.25	0.10	0.05

**Required:**

- (i) The expected value of the product. (3 marks)
  - (ii) The standard deviation of the product. (2 marks)
- (Total: 20 marks)**

**QUESTION THREE**

- (a) Outline four applications of indices in your country. (4 marks)
- (b) A quality inspection of 100 cartons containing 50 articles of a product in each carton revealed the following non-defective articles:

Number of non-defective articles	45	46	47	48	49	50
Number of cartons (cumulative)	6	18	46	82	98	100

**Required:**

- (i) The mean number of non-defective articles. (3 marks)
  - (ii) The standard deviation. (4 marks)
  - (iii) Probability of a carton containing 48 non-defective articles or less. (2 marks)
- (c) The return on a share purchased from a certain company depends on the brokerage fee and capital gains tax paid.

The return is expressed using the following function:

$$R = 48x + 60y + 10xy - 10x^2 - 6y^2$$

Where

- R = Return
- x = Brokerage fee
- y = Capital gains tax

**Required:**

- The values of x and y that maximise return. (7 marks)
- (Total: 20 marks)**

**QUESTION FOUR**

- (a) Highlight four merits of payback method of project appraisal. (4 marks)
- (b) The table below shows the cash flows of two mutually exclusive projects namely; P and Q, having the same useful life:

Year		0	1	2	3	4	5
Cash flows in Sh. "million"	P	-170	65	65	65	65	65
	Q	-500	155	155	155	155	155

The required rate of return is 12% for both projects P and Q.

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**Required:**

Evaluate each project using the net present value (NPV) method.

(4 marks)

- (c) Maryland Ltd. deals in the export of horticultural products to the COMESA market. The revenue and cost functions of the company are quadratic in nature.

Analysis of the company's records produced the following data:

Quantity of exports in units (x)	3	6	9
Revenue (R) Sh."000"	1,164	2,256	3,276
Total cost (C) Sh."000"	7,709	7,436	7,181

**Required:**

- (i) The revenue function. (3 marks)
- (ii) The total cost function. (3 marks)
- (iii) The profit function. (2 marks)
- (iv) The quantity which will maximise profit. (2 marks)
- (v) The maximum profit of the company. (2 marks)

(Total: 20 marks)

**QUESTION FIVE**

- (a) A cereal manufacturer makes breakfast cereals packed in boxes. The cost function is given by  $C = 4x^2 - 45x + 1200$  where x is in millions of boxes.

The revenue function of the manufacturer is given by  $R = 3x^2 + 35x$ .

**Required:**

- (i) The manufacturer's break-even number of boxes. (5 marks)
- (ii) The revenue at which maximum profit is realised. (4 marks)
- (iii) The maximum profit. (2 marks)

- (b) The following data show the prices and quantities of livestock products over a three-year period:

Years Product	Price per kilogramme (Sh.)			Quantities (Kg) "000"		
	2015	2016	2017	2015	2016	2017
Meat	280	340	360	400	480	520
Butter	60	72	80	660	672	705
Hides	100	120	110	80	95	72

**Required:**

- (i) The Laspeyre's index for 2016 and 2017 using 2015 as the base year. (4 marks)
- (ii) The Paasche's index for 2016 and 2017 using 2015 as the base year. (4 marks)
- (iii) Fisher's ideal index for 2016. (1 mark)

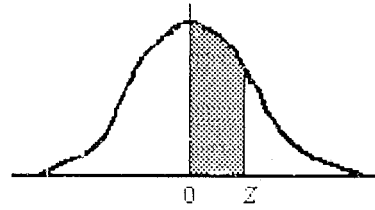
(Total: 20 marks)

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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