

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

**MONDAY: 26 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) Highlight four factors that might necessitate the shifting of the base of an index number. (4 marks)

(b) The following are the indices of a country for the years 2014 – 2018:

<b>Year</b>	2014	2015	2016	2017	2018
<b>Index</b>	216	228	212	236	244

**Required:**

The chain base indices using 2013 as the base year (2013=100). (3 marks)

(c) James Mwambao invested Sh.1,000,000 in two investment funds X and Y at simple interest rates of 9.5% and 11% per annum respectively. The total interest earned from the two investments over a one year period was Sh.103,850.

**Required:**

The amount of money James Mwambao invested in each investment fund. (5 marks)

(d) The Financial and Investment Analyst at ABC Ltd., a construction company, is considering investing in a certain project. The project has an initial cost of Sh.4 million and an economic life of four years with nil residual value.

The expected earnings before depreciation and tax of the project are as shown below:

<b>Year</b>	<b>Earnings before depreciation and tax (Sh.million)</b>
1	3.0
2	3.2
3	3.4
4	4.0

The corporate tax rate is 30% and the company's cost of capital is 15%.

Depreciation is to be provided for on a straight line basis.

**Required:**

Using the net present value (NPV) approach, advise the Financial and Investment Analyst of ABC Ltd. on whether to invest in the project. (8 marks)

**(Total: 20 marks)**

**QUESTION TWO**

(a) Highlight five factors that a company might consider when making a dividend policy decision. (5 marks)

(b) Madebe Limited borrowed Sh.400,000 from XYZ Commercial Bank at an interest rate of 1.8% compounded monthly. The loan is to be amortised using the reducing balance method and be repaid in 12 equal monthly instalments payable at the end of each month.

**Required:**

A loan amortisation schedule. (9 marks)

- (c) An investor plans to buy shares and hold them for four years. From past records, the probability distribution indicating the price of the share after one year is as follows:

Price per share (Sh.)	Probability
42	0.08
45	0.12
50	0.15
56	0.25
60	0.30
65	0.10

**Required:**

- (i) The expected price per share. (2 marks)
- (ii) The standard deviation of the share price. (2 marks)
- (iii) The coefficient of variation of the share price. (2 marks)

**(Total: 20 marks)**

**QUESTION THREE**

- (a) Summarise four advantages of the net present value (NPV) method used in measuring an investment's profitability. (4 marks)
- (b) The following data of medium manufacturing firms relate to daily expenditure to daily output in units of ten companies:

COMPANY	A	B	C	D	E	F	G	H	I	J
Daily output ("000" units)	5	10	14	22	20	32	30	30	45	50
Daily expenditure (Sh. "000")	180	240	250	300	315	340	305	300	340	370

**Required:**

- (i) The least squares regression line of daily expenditure on daily output. (8 marks)
- (ii) The daily expenditure associated with daily output of 35,000 units. (2 marks)
- (c) The probability of defective items in a certain manufacturing process is 0.10 in a total of 400 items.

**Required:**

Assuming binomial distribution, determine:

- (i) The mean. (2 marks)
- (ii) The standard deviation. (2 marks)
- (iii) The coefficient of skewness. (2 marks)

**(Total: 20 marks)**

**QUESTION FOUR**

- (a) The data given below show the distribution of share prices of fifty companies listed on a certain securities exchange of a country:

Share price (Sh.)	Number of companies
30 – 40	3
40 – 50	7
50 – 60	A
60 – 70	14
70 – 80	B
80 – 90	5
90 – 100	4
	<u>50</u>

The median share price of the companies is Sh.65.70.

**Required:**

- (i) The values of A and B. (4 marks)
- (ii) The mean share price of the companies. (3 marks)
- (iii) The modal share price of the companies. (3 marks)

- (b) A washing machine costs Sh.980,000. The machine is expected to depreciate to a scrap value of Sh.130,000 in 5 year's time.

**Required:**

- (i) Using the reducing balance method of depreciation, find the annual depreciation rate. (2 marks)
- (ii) The book value of the machine at the end of the third year, using the reducing balance method. (2 marks)
- (iii) Using the straight line method of depreciation, find the net book value of the machine at the end of the third year. (2 marks)

- (c) A market survey undertaken of 160 workers at the Nairobi industrial area revealed the following:

- 63 workers used personal cars to get to work.
- 82 workers used public vehicles to get to work.
- 63 workers used motorbikes to get to work.
- 26 workers used both motorbikes and public vehicles to get to work.
- 15 workers used both personal cars and public vehicles to get to work.
- 20 workers used personal cars and motorbikes to get to work.
- 6 workers did not use any of the three modes of transport to get to work.

**Required:**

- (i) Represent the given information in a Venn diagram. (2 marks)
- (ii) The number of workers who used all the three modes of transport to get to work. (2 marks)

(Total: 20 marks)

**QUESTION FIVE**

- (a) A factory produces bulbs that have a limited life. Records indicate that the life of the bulbs is normally distributed with a mean of 900 hours and a standard deviation of 80 hours.

**Required:**

Proportion of the bulbs that will fail:

- (i) Before 1,000 hours. (3 marks)
- (ii) Before 850 hours. (3 marks)
- (iii) Between 850 hours and 880 hours. (3 marks)
- (iv) Between 800 hours and 950 hours. (3 marks)

- (b) The total revenue function of an electronic company is quadratic in nature.

The data below show the number of television sets sold by the electronic company and their corresponding sales revenue:

Number of television sets sold (q)	15	20	30
Sales revenue (R) Sh.'000"	2,325	2,900	3,750

**Required:**

- (i) The total revenue function. (5 marks)
- (ii) The maximum revenue. (3 marks)

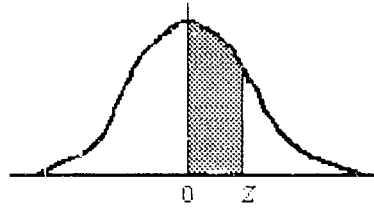
(Total: 20 marks)

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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	.2021	.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