

KASNEB

CIFA PART I SECTION 1

FINANCIAL MATHEMATICS

MONDAY: 22 May 2017.

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 methods of valuing shares:

- (i) Dividend yield method. (2 marks)
- (ii) Earnings method. (2 marks)
- (iii) Net asset method. (2 marks)
- (iv) Discounted cash flow method. (2 marks)

(b) The table below shows the interest rates of ABC Ltd.'s corporate bond sold over a period of 12 months:

Month	1	2	3	4	5	6	7	8	9	10	11	12
Interest rate (%)	12.1	11.9	12.0	12.2	12.4	12.3	12.4	12.5	12.7	12.6	12.8	12.9

Required:

- (i) Derive a trend function using the ordinary least squares method. (10 marks)
- (ii) Use the trend function obtained in (b) (i) above to estimate the interest rate of ABC Ltd.'s corporate bond in the 15th month. (2 marks)

(Total: 20 marks)

QUESTION TWO

(a) Distinguish between the following terms:

- (i) Margin and mark-up. (2 marks)
- (ii) Depreciation and appreciation. (2 marks)

(b) The cost function of a certain company is given by the function $C(X) = 6X^2 + 1,440X + 1,280$. The revenue function is given by $R(X) = 2,000X - 24X^2$.

X is in thousands of units.

Required:

- (i) Profit function of the company. (2 marks)
- (ii) The break even number of units. (3 marks)
- (iii) Number of units at which profit is maximised. (3 marks)

(c) An investor plans to make a series of payments to an investment fund. He deposits Sh.200,000 at the beginning of year 1, Sh.2,400,000 in year 2 and Sh.400,000 at the beginning of year 5. Due to financial constraints, the investor withdrew Sh.450,000 and Sh.250,000 at the beginning of year 3 and year 7 respectively with no withdrawal penalties. The investor's interest rate was at 14%.

Required:

- (i) The future value of the investment in 8 years' time. (4 marks)
- (ii) The present value of the investment. (2 marks)
- (iii) Explain the value additivity principle of net present value (NPV) method. (2 marks)

(Total: 20 marks)

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QUESTION THREE

The following data relate to the floor area of 300 houses designed by a developer in an upcoming residential area:

Floor Area (m ²)	Probability
20 – 40	0.02
40 – 60	0.07
60 – 80	0.15
80 – 100	0.32
100 – 120	0.23
120 – 140	0.11
140 – 160	0.04
160 – 180	0.03
180 – 200	<u>0.03</u>
	<u>1.00</u>

The approximate cost of construction is Sh.12,500 per square metre.

Required:

- (a) The mid class values. (2 marks)
- (b) The frequency of each class. (4 marks)
- (c) The arithmetic mean of the distribution. (4 marks)
- (d) The standard deviation. (4 marks)
- (e) An appropriate measure of skewness. Interpret your result. (4 marks)
- (f) The mean cost of houses in the area. (2 marks)

(Total: 20 marks)

QUESTION FOUR

- (a) State five purposes of financial models. (5 marks)
- (b) Kaza Mwendo borrowed Sh.80,000 from XYZ commercial bank at an interest rate of 1.25% 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) Faida Enterprises expects its earnings before interest and taxes (EBIT) to fluctuate with the economic environment as shown below. The earnings distribution is expected to continue in perpetuity. The company has one million shares outstanding and no debt in the capital structure. The company pays all its earnings in dividends and shareholders require a 12% return. The company pays no taxes.

Details	Economic environment			
	Bad	Fair	Good	Very good
Probability	0.25	0.25	0.25	0.25
EBIT (Sh. million)	2.2	3.8	4.8	6.0
Earnings per share (EPS) (Sh.)	2.2	3.8	4.8	6.0
Return if share price is Sh.35	6.29%	10.86%	13.71%	17.14%

Required:

- (i) Expected earnings per share. (2 marks)
- (ii) Standard deviation of earnings per share. (4 marks)

(Total: 20 marks)

QUESTION FIVE

- (a) State four properties of a normal probability distribution. (4 marks)
- (b) Highlight four shortcomings of consumer price index numbers. (4 marks)
- (c) The price of a share of ABC Limited is normally distributed with a mean of Sh.51.80 and a standard deviation of Sh.4.30.

Required:

The probability that the price of the share will be:

- (i) Greater than Sh.60.00. (4 marks)
- (ii) Less than Sh.36.40. (4 marks)
- (iii) Between Sh.41.80 and Sh.58.80. (4 marks)

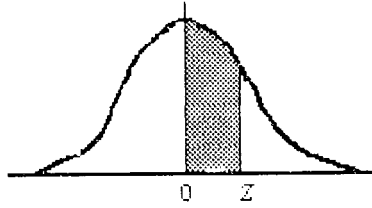
(Total: 20 marks)

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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