

KASNEB

CIFA PART I SECTION I

FINANCIAL MATHEMATICS

MONDAY: 21 November 2016.

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 disadvantages of using the net present value (NPV) method for project appraisal. (4 marks)
- (b) The table below shows fluctuations in price of two shares, A and B over the last four months.

Share price (Sh.)	Number of days over 4-month period	
	Share A	Share B
30 – 32	4	6
32 – 34	12	10
34 – 36	20	18
36 – 38	35	20
38 – 40	22	26
40 – 42	5	12
42 – 44	2	8

Required:

Advise a risk-averse investor on the share to invest in using coefficient of variation. (8 marks)

- (c) The variable cost for a newspaper run is Sh.65 per unit. The cost of set up is estimated to be $Sh.2x^2$ where x is the number of newspapers. The fixed cost per day is estimated at Sh.28,800.

Required:

- (i) The cost per unit function. (2 marks)
- (ii) The number of newspaper runs that minimises cost per unit. (4 marks)
- (iii) The total cost of the newspaper at the minimum cost per unit. (2 marks)

(Total: 20 marks)

QUESTION TWO

- (a) Matsangoni county government has proposed to sell a 5-year bond of Sh.5,000,000 at 8% rate of interest per annum.

Investors have a minimum required rate of return of 7%.

The bond's principal amount will be repaid equally over its life time.

Required:

The present value of the bond. (5 marks)

- (b) Deborah Mbetsa intends to purchase a private saloon car at a cost of Sh.800,000. She currently has Sh.620,000 which she intends to invest in two alternative plans.

Plan A: Invest at a simple interest rate of 5.4% per annum.

Plan B: Invest at a compound interest rate of 4.8% per annum.

Required:

The number of years Deborah Mbetsa will take to purchase the car under each of the alternative investment plans. (5 marks)

- (c) A retailer of a new beauty product has observed that he sells 126 units of the product when the price is Sh.55 and only 109 units of the product when the price is Sh.72.

The retailer's daily fixed cost is Sh.5,880 while the variable cost per unit is Sh.12.

Required:

- (i) A linear equation showing the relationship between the price (P) and the quantity demanded (x). (2 marks)
- (ii) The price at the break-even point. (4 marks)
- (iii) The price that maximises profit. (3 marks)
- (iv) The maximum profit. (1 mark)

(Total: 20 marks)

QUESTION THREE

- (a) State four assumptions that underlie the binomial distribution. (4 marks)

- (b) The following data show estimated probabilities and useful life of two plants, X and Y.

Useful life (years)	Estimated probabilities	
	Plant X	Plant Y
10	0.05	0.10
20	0.25	0.50
30	0.50	0.30
40	0.20	0.10

Required:

- (i) The expected useful life of each plant. (2 marks)
- (ii) The standard deviation of each plant. (4 marks)
- (c) The production level at a manufacturing company is approximately normally distributed with a mean of 134,786 units per month and a standard deviation of 13,000 units.

Required:

The probability that monthly production will:

- (i) Exceed 150,000 units. (3 marks)
- (ii) Drop below 100,000 units. (3 marks)
- (iii) Lie between 145,000 units and 160,000 units. (4 marks)

(Total: 20 marks)

QUESTION FOUR

- (a) The following data show the number of tonnes cleared weekly by a shipping agency in a busy port:

398	412	560	476	544	690	587	600	613	457	504	477	530
641	359	566	452	633	474	499	580	606	344	455	505	396
347	441	390	632	400	582							

Required:

- (i) Group the data into a frequency table with a class width of 50 starting with the class, 300 – 349. (4 marks)
- (ii) The mean weekly tonnage cleared. (3 marks)
- (iii) The standard deviation. (5 marks)
- (iv) The median of the data. (2 marks)
- (v) The skewness of the data. Interpret your result. (4 marks)
- (b) Highlight two merits of coefficient of variation over the standard deviation as measures of dispersion. (2 marks)

(Total: 20 marks)

QUESTION FIVE

(a) Zowerani Ltd. manufactures and sells two interdependent products, A and B.

The demand functions for the two products are given by:

$$P_A = 800 - x - 2y \quad \text{and} \quad P_B = 1,100 - x - 2.5y$$

Where; P_A is the unit price of product A

P_B is the unit price of product B.

x and y are the number of units of products A and B sold respectively.

The total cost function of producing both products is given by the function:

$$C = 150x + 50y.$$

Required:

- (i) The total revenue function. (2 marks)
 - (ii) The profit function. (2 marks)
 - (iii) The number of units of each product required to maximise total profit. (4 marks)
 - (iv) The selling price of each product. (1 mark)
 - (v) The maximum profit. (1 mark)
- (b) The following data relate to the prices of a good X in the various years:

Year	Price (Sh.)
2011	600
2012	650
2013	690
2014	680
2015	740

Required:

The chain base index for each of the years using 2011 as the base year. (2 marks)

(c) The following data give the quantities and prices of items purchased by a certain family for two consecutive years:

Items	Quantity (kilogrammes)		Prices (Sh.)	
	Year 1	Year 2	Year 1	Year 2
A	1,225	1,407	1,155	1,372
B	224	322	952	1,117
C	336	301	2,070	1,867
D	455	462	1,642	1,552

Required:

Using year 1 as the base year, calculate:

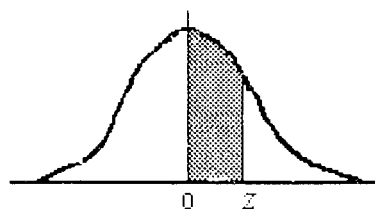
- (i) The Laspeyre's price index for year 2. (3 marks)
- (ii) The Paasche's price index for year 2. (3 marks)
- (iii) Fisher's ideal price index for year 2. (2 marks)

(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