INSTITUTE OF CERTIFIED PUBLIC ACCOUNTANTS OF RWANDA
Driving Sustainable Performance

Associate of IFAC

CERTIFIED ACCOUNTING TECHNICIAN
LEVEL 1 EXAMINATION
L1.4: BUSINESS MATHEMATICS
WEDNESDAY: 7 JUNE 2017

INSTRUCTIONS:

1. **Time Allowed: 3 hours 15 minutes** (15 minutes reading and 3 hours writing).
2. This examination has **seven(7)** questions and only **five(5)** questions are to be attempted.
3. Marks allocated to each question are shown at the end of the question.
4. Show all your workings.
5. All iCPAR Examination rules and regulations apply.

QUESTION ONE

(a) While reconciling books of account an accountant noted the amounts spent on the same item on three different occasions, in Frw million were as follows:

(i) 15.8363756

(ii) 15.08490

(iii) 15.0275

REQUIRED:

Express each amount to the accuracy of 3 significant figures. **(4 Marks)**

(b) The distance between Town (A) in Nyaruguru District and Town (B) in Kayonza District is 250 Km. A bus moves from(A) to (B) at an average speed of x Kmh^{-1} and returns to (A) at an average speed reduced by 4 Kmh^{-1}. The entire journey took $5\frac{1}{2}$hours.

REQUIRED:

(i) Form and simplify an equation for x. **(4 Marks)**

(ii) Solve for x. **(3 Marks)**

(c) The profit, P (Frw '000') of micro enterprise in a period of one week is influenced by the investment, q (Frw '000,000'). The function of (P) is given by $P = (1 - q)(q - 6)$.

REQUIRED:

(i) Plot a graph for $P = (1 - q)(q - 6)$ for the domain $1 \leq q \leq 6$ **(6 Marks)**

(ii) Use the graph in c(i) above to determine the:

- Investment that yields a profit of 5. **(2 Marks)**
- Maximum value of (P). **(1 Mark)**

(Total 20 Marks)

QUESTION TWO

(a) It is claimed that six out of ten African people are under the age of 18 years. In a certain African country, the population is 14 million.

REQUIRED:

Calculate the:

(i) Expected number of people who are under the age of 18 years. **(2 Marks)**

(ii) Number of girls in this country who are under the age of 18 years given that the ratio of girls to boys is 3:1. **(2 Marks)**

(b) The human resource management department periodically conducts interviews for job placements. To qualify for the second interview, one must pass the preliminary interview. Keza and Shyaka applied for a job and sat the preliminary interview. The probability that Keza and Shyaka qualify for the second interview are $\frac{3}{5}$ and $\frac{3}{7}$ respectively.

REQUIRED:

Find the probability that for the second interview:

(i) Both Keza and Shyaka qualify. **1 Mark)**

(ii) Either Keza or Shyaka but not both qualify. **(4 Marks)**

(iii) At least one of them qualifies. **(2 Marks)**

(c) Nkunzi Stores Limited deals in beans that are packed in 50 Kg sacks. On different occasions the beans were randomly weighed and found to be under weight X, with the probabilities given in the table.

X	1	3	6	n	12
Probability P(X)	0.1	0.3	**k**	0.25	0.15

REQUIRED:

Find the value of:

(i) k. **(2 Marks)**

(ii) n given that E(X) = 6. **(4 Marks)**

(iii) E(X^2). **(3 Marks)**

(Total 20 Marks)

QUESTION THREE

(a) (i) Outline any three merits of the chain base method of computing index numbers. **(3 Marks)**

(ii) The table below gives the variation of the unit price of a certain commodity over a period of time.

Year	2014	2015	2016
Price (Frw)	350	370	345

REQUIRED:

Construct chain base index numbers from the given data. **(3 Marks)**

(b) Abayisenga and Company Limited revised salaries of their employees in a bid to cope with inflation and in fulfillment of an overdue promise to their employees. The table below gives the breakdown of the improved salaries per annum.

Salary per annum	Number of employees
Frw '000,000'	
15.2 – 16.8	3
16.9 – 18.5	5
18.6 – 20.2	12
20.3 – 21.9	20
22.0 – 23.6	15
23.7 – 25.3	4
25.4 – 27.0	1

REQUIRED:

(i) Calculate the improved mean salary to the nearest million. **(4 Marks)**

(ii) Determine the standard deviation of the improved salary to the nearest million. **(3 Marks)**

(iii) Construct a histogram for the improved salaries and use it to estimate the modal salary, to 2 decimal places. **(5 Marks)**

(iv) Hence find Karl Pearson's coefficient of skewness, to one decimal place. **(2 Marks)**

(Total 20 Marks)

QUESTION FOUR

(a) As a requirement for mature age entry into one of the leading private universities in Kigali, a group of seven students sat for two different aptitude tests. The results of each test are as given below.

Student	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Aptitude 1	44	35	25	40	17	48	50
Aptitude 2	38	48	44	58	54	56	47

REQUIRED:

(i) Calculate Spearman's coefficient of rank correlation between the two aptitude tests. **(6 Marks)**

(ii) Comment on the result in a(i) above. **(1 Mark)**

(b) Hakizimana Mining Company Limited mines sand for sale in Nyamasheke District. The sales and total cost were extracted from its records and compiled on quarterly basis for a period of four years as given below:

Sand (x) '000' tonnes	10	14	18	29	35	40	46	55	61	69	74	79
Total cost (y) million Francs	30	35	38	50	55	60	70	73	81	86	94	96

REQUIRED:

(i) Plot a scatter diagram for the data. **(4 Marks)**

(ii) Comment on the correlation. **(1 Mark)**

(iii) Construct a best line for the data. **(1 Mark)**

(iv) Find the equation of best line in b **(iii)** above. **(3 Marks)**

(v) Use the equation in b **(iv)** above to determine:

- y when x is 78 tonnes. **(2 Marks)**
- x when y is 65 million Francs. **(2 Marks)**

(Total 20 Marks)

QUESTION FIVE

(a) Outline any two limitations of forecasting. **(2 Marks)**

(b) ABC Diaries Limited realised the following profits (in million Francs) in the years given below.

Year	2007	2008	2009	2010	2011	2012	2013
Profit (million)	60	72	75	65	80	85	95

REQUIRED:

(i) Determine the equation of the straight line trend by the method of least squares. **(9 Marks)**

(ii) Show the trend values. **(2 Marks)**

(iii) Estimate the profit for 2017. **(2 Marks)**

(iv) Find the monthly increase in profit. **(2 Marks)**

(v) Eliminate the season variations using the multiplicative model. **(3 Marks)**

(Total 20 Marks)

QUESTION SIX

(a) (i) Define the term "**annuity**". **(2 Marks)**

(ii) Distinguish between certain and perpetual annuities. **(2 Marks)**

(b) Ms Gisa invested Frw 12.5 million at a rate of 12% per annum for 4 years.

REQUIRED:

Determine the:

(i) Net present value of Ms Gisa's investment, to the nearest million. **(4 Marks)**

(ii) Interest Ms Gisa earned per annum. **(2 Marks)**

(c) Bakunda SACCO borrowed Frw 25 million from Guaranty Trust Bank Rwanda Limited so as to expand their lending portfolio. The SACCO is to pay back the loan in 8 years time, at a rate of 10%, amortised by equal annual payments.

REQUIRED:

Determine the:

(i) Amount to be paid per annum. **(4 Marks)**

(ii) Interest earned by the bank per annum. **(2 Marks)**

(iii) The increase in the amount to be paid per annum if the bank had offered a period of 5 years only. **(4 Marks)**

(Total 20 Marks)

QUESTION SEVEN

(a) Identify any four functions of commonly used spreadsheet software. **(4 Marks)**

(b) In a certain accountancy college in Kigali, students sat for a mock examinations before sitting for the June 2017 iCPAR examinations. The scores, X in one of the subjects was normally distributed with mean, μ and standard deviation δ. It was further observed that the probability of a candidate scoring above 55% was 0.0228 and that of a candidate scoring below 42.5% was 0.0013.

REQUIRED:

(i) Form two simultaneous equations in μ and δ. **(4 Marks)**

(ii) Solve for μ and δ. **(3 Marks)**

(iii) Find the probability that a candidate scored between 45% and 48.8%. **(3 Marks)**

(c) The following table gives the output in tonnes of maize flour produced by workers in a milling company.

Maize flour (tonnes)	400 - 430	430 - 460	460 - 490	490 - 520	520 - 550
Number of workers	31	58	60	k	27

REQUIRED:

Determine the value of (k) given that the mean of the above distribution is 472 tonnes. **(6 Marks)**

(Total 20 Marks)

End of question paper

CUMULATIVE NORMAL DISTRIBUTION *P(z)*

Z	0	1	2	3	4	5	6	7	8	9	ADD 1	2	3	4	5	6	7	8	9
0.0	0.0000	0040	0080	0120	0160	0199	0239	0279	0319	0359	4	8	12	16	20	24	28	32	36
0.1	0.0398	0438	0478	0517	0557	0596	0636	0675	0714	0753	4	8	12	16	20	24	28	32	36
0.2	0.0793	0832	0871	0910	0948	0987	1026	1064	1103	1141	4	8	12	15	19	22	27	31	35
0.3	0.1179	1217	1255	1293	1331	1368	1406	1443	1480	1517	4	8	11	15	19	22	26	30	34
0.4	0.1554	1591	1628	1664	1700	1736	1772	1808	1844	1879	4	7	11	14	18	22	25	29	32
0.5	0.1915	1950	1985	2019	2054	2088	2123	2157	2190	2224	3	7	10	14	17	21	24	27	31
0.6	0.2257	2291	2324	2357	2389	2422	2454	2486	2517	2549	3	6	10	13	16	19	23	26	29
0.7	0.2580	2611	2642	2673							3	6	9	12	15	19	22	25	28
					2704	2734	2764	2794	2823	2852	3	6	9	12	15	18	21	24	27
0.8	0.2881	2910	2939	2967	2995	3023					3	6	8	11	14	17	20	22	25
							3051	3078	3106	3133	3	5	8	11	13	16	19	22	24
0.9	0.3159	3186	3212	3238	3264	3289					3	5	8	10	13	16	18	21	23
							3315	3340	3365	3389	2	5	7	10	12	15	17	20	22
1.0	0.3413	3438	3461	3485	3508						2	5	7	10	12	14	17	19	22
						3531	3554	3577	3599	3621	2	4	7	9	11	13	15	18	20
1.1	0.3643	3665	3686	3708							2	4	6	8	11	13	15	17	19
					3729	3749	3770	3790	3810	3830	2	4	6	8	10	12	14	16	18
1.2	0.3849	3869	3888	3907	3925						2	4	6	8	10	11	13	15	17
						3944	3962	3980	3997	4015	2	4	5	7	9	11	13	14	16
1.3	0.4032	4049	4066	4082	4099	4115	4131	4147	4162	4177	2	3	5	6	8	10	11	13	14
1.4	0.4192	4207	4222	4236	4251	4265	4279	4292	4306	4319	1	3	4	6	7	8	10	11	13
1.5	0.4332	4345	4357	4370	4382	4394	4406	4418	4429	4441	1	2	4	5	6	7	8	10	11
1.6	0.4452	4463	4474	4484	4495	4505	4515	4525	4535	4545	1	2	3	4	5	6	7	8	9
1.7	0.4554	4564	4573	4582	4591	4599	4608	4616	4625	4633	1	2	3	3	4	5	6	7	8
1.8	0.4641	4649	4656	4664	4671	4678	4686	4693	4699	4706	1	1	2	3	4	4	5	6	6
1.9	0.4713	4719	4726	4732	4738	4744	4750	4756	4761	4767	1	1	2	2	3	4	4	5	5
2.0	0.4772	4778	4783	4788	4793	4798	4803	4808	4812	4817	0	1	1	2	2	3	3	4	4
2.1	0.4821	4826	4830	4834	4838	4842	4846	4850	4854	4957	0	1	1	2	2	2	3	3	4
2.2	0.4861	4864	4868	4871	4875	4878	4881	4884	4887	4890	0	1	1	1	2	2	2	3	3
2.3	0.4893	4896	4898	4901	4904	4906	4909	4911	4913	4916	0	0	1	1	1	2	2	2	2
2.4	0.4918	4920	4922	4925	4927	4929	4931	4932	4934	4936	0	0	1	1	1	1	1	2	2
2.5	0.4938	4940	4941	4943	4945	4946	4948	4949	4951	4952									
2.6	0.4953	4955	4956	4957	4959	4960	4961	4962	4963	4964									
2.7	0.4965	4966	4967	4968	4969	4970	4971	4972	4973	4974									
2.8	0.4974	4975	4976	4977	4977	4978	4979	4979	4980	4981									
2.9	0.4981	4982	4982	4983	4984	4984	4985	4985	4986	4986									
3.0	0.4987	4990	4993	4995	4997	4998	4998	4999	4999	5000									

The table gives $P(z) = \int_0^z \phi(z)dz$

If the random variable Z is distributed as the standard normal distribution N(0,1) then:

1. $P(o < Z < z_p) = P$(Shaded Area)
2. $P(Z > Z_p) = Q = ½ - P$
3. $P(Z > |Z_p|) = 1 - 2P = 2Q$