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**CERTIFIED PUBLIC ACCOUNTANT  
FOUNDATION 1 EXAMINATIONS**

**F1.1: BUSINESS MATHEMATICS AND QUANTITATIVE  
METHODS**

**MONDAY: 05 JUNE 2017**

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**INSTRUCTIONS:**

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

*Attempt any five questions*

**QUESTION ONE**

(a) Outline any four ways of data presentation. **(4 Marks)**

(b) A hardware store in Gakenke District sales a standard-length iron bar for Frw 5,000. A competitor found out that, if the standard length is reduced by 3 meters and each meter costing Frw 1,000 more, then the cost per meter of the iron bar and standard-length iron bar would be the same.

**REQUIRED:**

Compute the standard length of the iron bar. **(6 Marks)**

(c) The table below shows work force distribution in Kicukiro District in thousands.

Sector	Managers	Business	Education	Medical	Others
Number in (“000”)	95	175	155	80	35

**REQUIRED:**

Represent the above data using a pie chart(visual impression, not to scale) **(6 Marks)**

(d) MT Bakery (MTB) is one of the fastest growing bakeries in Kigali. MTB’s marginal revenue function is given by, where  $q$  is the quantity of bread produced (in thousands).

**REQUIRED:**

Determine the value of  $q$  where the marginal revenue function is equal to zero. **(4 Marks)**

**(Total 20 Marks)**

**QUESTION TWO**

(a) Using mathematical expressions, distinguish between a discrete and continuous probability random variable. **(2 Marks)**

(b) In June 2016, TK Telecom Ltd one of the leading telecommunication companies in Rwanda administered an aptitude test to applicants who responded to a financial analyst job that was advertised in the press. The following data scores were recorded according to gender.

Gender	Number of applicants	Mean % score	Variance
Male	72	68	9
Female	38	61	4

**REQUIRED:**

Determine:

(i) Which gender group had a greater coefficient of variation in scores. **(3 Marks)**

(ii) The combined mean score for both genders. **(3 Marks)**

- (c) Ten secondary schools in Rusizi District placed orders of different titles of principles of accounting text books from Superior Book Centre Limited (SBCL).

School	A	B	C	D	E	F	G	H	I	J
Book Titles	15	13	14	15	14	30	11	12	14	12

**REQUIRED:**

Calculate the variance of the principles of accounting text books orders SBCL received. **(5 Marks)**

- (d) During school inspection, a re-known inspector of schools in Rusizi District, Mr Ganza travels by riding a motor cycle or drives a car or travels by taxi. The probability of a day being sunny is  $\frac{4}{7}$  and the probability of a day being rainy is  $\frac{3}{7}$ . If the day is sunny the probability that Mr Ganza will cycle is  $\frac{7}{10}$ , the probability that he will drive is  $\frac{1}{5}$  and the probability that he will travel by taxi is  $\frac{1}{10}$ . If the day is rainy, the probability that Mr Ganza will cycle is  $\frac{1}{9}$ , the probability that he will drive is  $\frac{5}{9}$  and the probability he will travel by taxi is  $\frac{1}{3}$ .

**REQUIRED:**

- (i) Draw a probability tree diagram to represent the above information. **(3 Marks)**
- (ii) For any day selected, determine the probability that it is a rainy day and Mr Ganza will travel by taxi. **(1 Marks)**
- (iii) If Mr. Ganza inspects schools 245 days in a year, find approximately the number of days he travels by car to inspect schools. **(3 Marks)**

**(Total 20 Marks)**

**QUESTION THREE**

- (a) Briefly explain the following terms as used in sampling theory:
- (i) Stratified sampling **(2 Marks)**
- (ii) Systematic sampling. **(2 Marks)**
- (b) From a sample of 700 workers drawn from a normal population of Gatsibo Hard core factory, the mean wage and standard deviation of the wages were found to be Frw 36,500 and Frw 350 respectively.

**REQUIRED:**

Compute the number of workers earning a wage:

- (i) More than Frw 37,000. **(6 Marks)**
- (ii) Less than Frw 36,200. **(6 Marks)**
- (iii) Between Frw 36,250 and 37,000. **(4 Marks)**

**(Total 20 Marks)**

## QUESTION FOUR

- (a) Distinguish between seasonal variation and cyclical variation in time series analysis. **(2 Marks)**
- (b) Families in Bugesera District have expenditure on basic items whose prices in the months of March and April 2017 are as indicated in the table below.

	Item			
	Food	Clothes	Sugar	Fuel
Percentage expenditure	45%	20%	15%	20%
Price in March (Frw)	75,000	49,000	25,000	50,000
Price in April (Frw)	90,000	55,000	31,000	68,000

### REQUIRED:

- (i) Compute the consumer price index. **(10 Marks)**
- (ii) Comment on the values obtained in (i) above. **(1 Mark)**
- (c) The data below indicates the quarterly sales of tea in thousands of tonnes from Huye Tea factory in 2016.

Quarter ( $x$ )	1	2	3	4
Sales ( $y$ ) '000' tonnes	20	32	62	30

### REQUIRED:

Determine the quarterly sales trend line using the method of least squares. **(7 Marks)**

**(Total 20 Marks)**

## QUESTION FIVE

- (a) Distinguish between the terms total float and free float for an activity in a project net work. **(2Marks)**
- (b) Mbarushimana and Hitimana have decided to undertake a project to revamp an overgrown compound garden. The project has been broken down in eight specific activities as shown in the precedence activity table below.

Activity name	Preceding activity	Duration (hours)
A	-	5
B	-	1
C	B	2
D	B	1
E	A, C	3
F	E	1
G	C	1
H	D, G	6



**REQUIRED:**

- (i) Determine earliest start (ES) and latest start (LS) times of each activity on network activity nodes. **(8 Marks)**
  - (ii) Determine the total float for each activity and hence state the critical activities and optimum duration of the project. **(5 Marks)**
  - (c) Draw a Gantt chart for this project. **(5 Marks)**
- (Total 20 Marks)**

**QUESTION SIX**

(a) A furniture company wins a tender to produce dining chairs and table in the month of July 2017. The company has Frw 10,000,000 to buy materials, each chair requires Frw. 20,000 of material and each table requires materials worth Frw 100, 000. Each table requires 15 hours of work and each chair requires 4 hours of work. There are 1,950 hours for craftwork each month. The company has budgeted to sell each chair at Frw 80,000 and each table at Frw 350,000. The production plan is to maximise the potential income.

**REQUIRED:**

- (i) Formulate the above information as a linear programming model. **(4 Marks)**
  - (ii) Use graphical method to solve the linear programming model. **(5 Marks)**
  - (iii) Had the simplex tableau method been used slack variables, would be needed. State what the slack variables would have represented and their values at the solution level. **(2 Marks)**
  - (iv) Comment on any practical difficulty that may be involved with the solution to this problem. **(1 Mark)**
- (b) A concrete company wishes to transport tonnes of concrete slabs from factories 1, 2 and 3 to building sites A, B and C. The plant factories have the capacity to supply tons of concrete slabs per week as follows:

Factory plant	1	2	3
Supply capacity	100	300	300

The requirements of tonnes of concrete slabs for each site per week is as follows:

Building site	A	B	C
Site requirement	300	200	200

The cost for transporting concrete slabs from factory plant to building sites in thousands of Rwanda Francs is shown in the table:

	Site		
Factory	A	B	C
1	5	4	3
2	8	4	3
3	9	7	5

## REQUIRED

Using the North-West Corner rule method express the initial transformation.

- (i) Express the initial transport assignment and cost in one table. **(5 Marks)**
- (ii) Interpret the values in (i) and determine the initial feasible transport cost for these problems. **(3 Marks)**

**(Total 20 Marks)**

## QUESTION SEVEN

- (a) Distinguish between minimax and maximin as used in decision theory. **(2 Marks)**
- (b) Dusabimana has to decide between a risky business venture with prospects of Frw 8 million and Frw 5 millions with probabilities of 0.65 and 0.35 respectively and, a diversified investment venture consisting of two agreements with independent outcomes with prospects of Frw 3.85 million and Frw 2.7 million and, probabilities of 0.54 and 0.46 respectively.

## REQUIRED:

- (i) Construct a decision tree for Dusabimana. **(10 Marks)**
- (ii) Compute the expected monetary value for the risky business and the diversified investment. **(6 Marks)**
- (iii) Advice Dusabimana on which of the two ventures he should take on. **(2 Marks)**

**(Total 20 Marks)**

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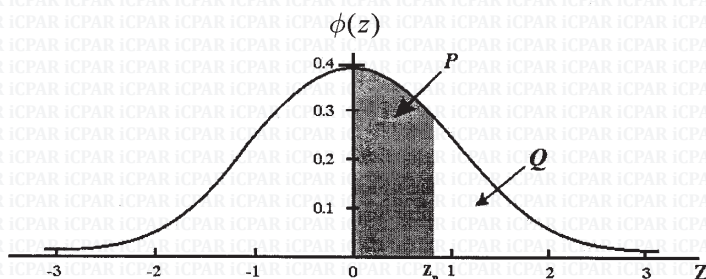
**End of question paper**

CUMULATIVE NORMAL DISTRIBUTION $P(z)$											ADD								
$Z$	0	1	2	3	4	5	6	7	8	9	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	2704	2734	2764	2794	2823	2852	3	6	9	12	15	18	21	24	27
0.8	0.2881	2910	2939	2967	2995	3023	3051	3078	3106	3133	3	6	8	11	14	17	20	22	25
0.9	0.3159	3186	3212	3238	3264	3289	3315	3340	3365	3389	3	5	8	11	13	16	19	22	24
1.0	0.3413	3438	3461	3485	3508	3531	3554	3577	3599	3621	2	5	7	10	12	14	17	19	22
1.1	0.3643	3665	3686	3708	3729	3749	3770	3790	3810	3830	2	4	7	9	11	13	15	18	20
1.2	0.3849	3869	3888	3907	3925	3944	3962	3980	3997	4015	2	4	6	8	10	11	13	15	17
1.3	0.4032	4049	4066	4082	4099	4115	4131	4147	4162	4177	2	4	5	7	9	11	13	14	16
1.4	0.4192	4207	4222	4236	4251	4265	4279	4292	4306	4319	2	3	5	6	8	10	11	13	14
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	4857	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:

- $P(0 < Z < z_p) = P(\text{Shaded Area})$
- $P(Z > z_p) = Q = \frac{1}{2} - P$
- $P(Z < -z_p) = 1 - 2P = 2Q$



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