

CERTIFIED PUBLIC ACCOUNTANT FOUNDATION LEVEL 1 EXAMINATION

F1.1: BUSINESS MATHEMATICS AND QUANTITATIVE METHODS

THURSDAY: 4 DECEMBER 2014

INSTRUCTIONS:

- 1. Time Allowed: 3 hours 15 minutes (15 minutes reading and 3 hours writing).**
- 2. This examination has seven questions and only five questions are to be attempted.**
- 3. Marks allocated to each question are shown at the end of the question.**
- 4. Show all your workings, where applicable.**

QUESTION ONE

- a) Your uncle wishes to invest his accumulated savings of Frw 500,000 in one of the three possible Investment Plans for a period of 2 years and has consulted you for advice. All the three Plans pay compound interest accrued at the end of the previous year as follows: **Plan (A)** pays 13% interest rate compounded annually. **Plan (B)** pays 12.5% interest rate compounded twice a year while **Plan (C)** pays 12% interest rate compounded 6 times in a year.

Required:

- (i) Calculate the value of each Plan after the 2 year Period. **(9 Marks)**
- (ii) Which is the best Plan for your Uncle? Justify your choice. **(2 Marks)**

- b) The sales revenue and total cost functions of a local Juice bottling plant in Frw millions are $R(x) = 90x - 2x^2$ and $C(x) = 800 + 30x$ respectively, where x is the number of bottles.

Required:

Using graphical method or equation method find:

- (i) The Overhead Cost (Fixed Cost) **(2 Marks)**
 - (ii) The Profit or loss made when $x = 10$ bottles **(3 Marks)**
- c) The number of bottles sold in order to break-even **(4 Marks)**

(Total 20 Marks)

QUESTION TWO

The following information relates to a project which was broken down into 14 activities.

Activity	Preceding Activity	Normal Duration (months)	Crash Duration (months)	Crashing Cost (Frw)
A	None	3	2	2,300
B	None	2	1	4,000
C	A	7	5	5,000
D	A	1	0	0
E	B	4	0	0
F	B	5	3	2,100
G	D,E	4	3	1,800
H	D,E	6	4	6,000
I	F	3	2	3,000
J	C,G	5	4	5,000
K	C,G	3	0	0
L	H,J	4	3	6,000
M	I	2	0	0
N	K,L	5	4	4,000

Required:

- a) Determine how long it will take to complete this project assuming that each activity is done in the normal time. **(16 Marks)**
- b) Management would like to have the project completed in 20 months by all means. Determine the total crash cost that will be incurred when the management objective is adhered to. **(4 Marks)**

(Total 20 Marks)

QUESTION THREE

The following table is a payoff table for a particular venture.

		States of nature					
		θ_1	θ_2	θ_3	θ_4	θ_5	θ_6
Decision Alternative	D_1	280	300	260	360	400	450
	D_2	320	420	540	300	280	380
	D_3	200	360	400	440	250	320
	D_4	350	260	390	500	380	260

The relative likelihood's of occurrence for the states of nature are $f(\theta_1) = 0.18$, $f(\theta_2) = 0.10$, $f(\theta_3) = 0.16$, $f(\theta_4) = 0.24$, $f(\theta_5) = 0.20$, and $f(\theta_6) = 0.12$.

Required:

- Determine the decision alternative that maximizes expected payoff. (10 Marks)
 - Determine expected value under certainty. (6 Marks)
 - What is the expected value of perfect information? (4 Marks)
- (Total 20 Marks)

QUESTION FOUR

- a) In a particular life insurance office, employees Simon, Julie, Willy and Billy have a diploma, with Simon and Billy also having a degree. Simon, Mark, Willy, Tony, Moses and Kelly are associate members of the Chartered Insurance Institute (ACII) with Tony and Moses having a diploma.

Required:

Identifying set (A) as those employees with diploma, set (C) as those employees who are ACII and set (D) as having a degree:

- Specify the elements of sets (A), (C) and (D). (3 Mark)
 - Draw a Venn diagram representing sets A, C and D, together with their known elements. (2 Marks)
 - What special relationship exists between sets A and D? (2 Marks)
 - Specify the elements of the following sets and for each set, state in words what information is being conveyed: $A \cap C$; $D \cup C$ and $D \cap C$. (2 Marks)
 - What will be a suitable universal set for this situation? (1 Mark)
- b) The purchasing department has analysed the number of orders placed by each of the 5 departments in the company by type in the table below:

Order type	Sales	Purchase	Production	Accounts	Maintenance	Total
Consumables Order	10	12	4	8	4	38
Equipment Order	1	3	9	1	1	15
Special Order	0	0	4	1	2	7
Total	11	15	17	10	7	60

An error has been found in one of these orders.

Required:

- i) Determine the probability that the incorrect order was not for consumables. **(2 Marks)**
- ii) Determine the probability that the incorrect order came from Maintenance or Production Department. **(2 Marks)**
- iii) Calculate the probability that the incorrect order was an Equipment order from Purchase Department. **(2 Marks)**
- c) (i) Under what conditions does $P(A/B) = P(A)$? **(2 Marks)**
- (ii) What is the addition rule of probability and for what type of events is it valid? **(2 Marks)**

(Total 20 Marks)**QUESTION FIVE**

- a) Explain the meaning of each of the 4 components of a time series with the aid of a diagram. **(8 Marks)**
- b) The data below show the sales volume (in Tons) of a cooperative union recorded over the first 8 months of the year 2014.

Month	January	February	March	April	May	June	July	August
Sales volume	3,000	4,000	6,000	5,000	8,000	12,000	17,000	20,000

Required:

- i) Using the Method of Least Squares, calculate the trend line that can be used to forecast sales revenue. **(9 Marks)**
- ii) Using Four Trend Line in (i) above, forecast sales revenue for the remaining months of the year 2014 and comment on the reliability of your forecasts. **(3 Marks)**

(Total 20 Marks)**QUESTION SIX**

Kubaho is considering introducing a new product, Wholefood. Existing machines now used for making some of the present range of products could be used instead for baking the new product Wholefood. However, new special batch mixing equipment will be needed. This cannot be purchased but can be hired from a franchiser in three alternative specifications, for batch sizes of 200, 300 and 600 units respectively. The annual cost of hiring the mixing equipment would be Frw. 500 million, Frw. 15 billion and Frw. 21.5 billion respectively.

The present range of products which would be dropped currently earns a contribution of Frw. 90 billion per annum which is confidently expected could be continued if the product were retained.

The company's marketing manager considers that at the market price for Wholefood of Frw. 4,000 per unit, it is equally probable that the demand for this product would be 60,000 or 100,000 units per annum.

The company's production manager has estimated that variable cost per unit of making the Wholefood and probabilities of these costs being incurred as follows:

Batch size	200	300	600	600
Cost per unit (Frw)	Prob. If annual sales are 60,000 units	Prob. If annual sales are 100,000 units	Prob. If annual sales are 60,000 units	Prob. If annual sales are 100,000 units
2,000	0.1	0.2	0.3	0.5
2,500	0.1	0.5	0.1	0.2
3,000	0.8	0.3	0.6	0.3

Required:

- Draw a decision tree setting out the problem faced by the company (12 Marks)
- Show in each of the following situations, which size of mixing machine, if any, the company should hire;
 - To satisfy maximin criterion (2 Marks)
 - To maximize expected value of contribution per annum (2 Marks)
 - To minimize the probability of earning annual contribution of less than Frw. 100 billion. (4 Marks)

Total: (20 Marks)

QUESTION SEVEN

A carpenter makes various types of furniture and each of them must go through pre-finishing.

Because of the size and complexity of each type of furniture, the processing time in minutes at each stage varies considerably as detailed below:

Time in minutes			
Type	Stage 1	Stage 2	Stage 3
Chair	14	4	10
Desk	20	12	16
Lamp stand	12	8	8
Cupboard	14	6	4
Table	16	10	4

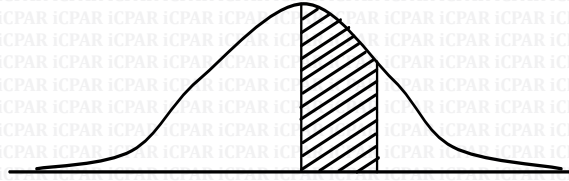
Required:

- Determine an optimal order in which the five types of furniture should be processed through the three stages in order to minimize the total processing time. Find the minimum total time. (16 Marks)
- What is the total idle time at stages 1, 2, and 3 (4 Marks)

(Total 20 Marks)

End of question paper

Normal table



Area between 0 and z

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0	0	0.004	0.008	0.012	0.016	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.091	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.148	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.17	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.195	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.219	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.258	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.291	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.334	0.3365	0.3389
1	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.377	0.379	0.381	0.383
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.398	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.437	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.475	0.4756	0.4761	0.4767
2	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.483	0.4834	0.4838	0.4842	0.4846	0.485	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.489
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.492	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.494	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.496	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.497	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.498	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.499	0.499



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