CERTIFIED ACCOUNTING TECHNICIAN
LEVEL 1 EXAMINATION
L1.4: BUSINESS MATHEMATICS
WEDNESDAY: 8 JUNE 2016

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.

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QUESTION ONE

(a) Three unskilled young men undertook work so as to raise capital to start a business. After a year of hard work, their joint contribution was Frw 2,500,000 in the ratio 5:3:2.

Required

    (i) Calculate the least contribution. **(3 Marks)**

    (ii) Calculate the largest contribution **(2 Marks)**

(b) Sehene and Peace decided to invest in shares of two companies A and B. With Frw 380,000, Sehene bought 1,500 shares in A and 800 shares in B, while Peace with Frw 450,000 bought 2,000 shares in A and 500 shares in B

Required:

    (i) Determine the share prices for the two companies at the time Sehene and Peace acquired their share. **(5 Marks)**

    (ii) Determine the amount that Hope a prospective investor needs to acquire 1,000 shares in company A and 1,500 shares in company B at the rates determined in (b)(i) above. **(3 Marks)**

(c) Major Gatare rented two adjacent pieces of land to construct a car parking shade and a washing bay. The surveyor took the measurements and one piece was in a square form of side $2x$ units while the other piece was rectangular measuring $(x+2)$ by $(x-8)$ units.

Required:

If the total area of Major Gatare's rented land was 1,019 square units, determine the value of x and hence give the measurements of the two pieces of land. **(7 Marks)**

(Total 20 Marks)

QUESTION TWO

(a) Given that two events A and B are such that $P(A)=\frac{2}{3}, P(A\cup B)=\frac{3}{4}$ and $P(A\cap B)=\frac{5}{12}$

Required:

    Compute P(B) **(2 Marks)**

(b) There are three cards in each of the two boxes in a room. The first box contains cards labeled 1, 3 and 5 while the second contains cards labeled 0,2 and 4. In a game, a player draws one card at random from each box and x is the sum of the numbers on the two cards.

    Required:

    (i) Find a possibility space **(3 Marks)**

    (ii) Use the possibility space to prepare a probability distribution table. **(5 Marks)**

(c) A survey was carried out on 100 students about watching movies. 40 students had watched a science fiction movie, 55 had watched an adventure movie while 35 had watched a horror movie, 25 students had watched science fiction and adventure movies, 5 had watched adventure and horror movies, and 15 had watched science fiction and horror movies. Only 5 students had watched movies of all the three categories.

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Required:

(i) Represent the above data on a Venn diagram. **(7 Marks)**

(ii) Determine the number of students who had never watched any of the three movies. **(1 Mark)**

(iii) Determine the number of students who had watched science fiction and horror movies as a percentage of those who had watched a science fiction. **(2 Marks)**

(Total 20 Marks)

QUESTION THREE

(a) Distinguish between data and information. **(2 Marks)**

(b) The a frequency distributiontable below shows the time in seconds(s) taken by 50 first year students in Kigali University in a marathon race.

Time (s)	Frequency
21.0 – 21.4	1
21.5 – 21.9	1
22.0 – 22.4	2
22.5 – 22.9	5
23.0 – 23.4	6
23.5 – 23.9	10
24.0 – 24.4	9
24.5 – 24.9	5
25.0 – 25.4	5
25.5 – 25.9	3
26.0 – 26.4	2
26.5 – 26.9	1

Required:

Reconstruct the frequency distribution with the following class intervals.

Time (s)
21.0 – 22.4
22.5 – 22.9
23.0– 23.4
23.5–23.9
24.0–24.4
24.5–24.9
25.0–25.4
25.5 – 25.9
26.0 – 26.9

(4 Marks)

(c) Use the reconstructed frequency table in (b) above to:

(i) Construct a histogram and henceuse it to estimate the mode. **(6 Marks)**

(ii) Calculate the median time in seconds. **(3 Marks)**

(d)   The percentage of monthly returns on an ordinary share X has a normal distribution with a mean of 3 and a variance 4. In a particular month, the return was $x = 6$.

   Required:

   (i) Explain how you would calculate the standardized return.   **(2 Marks)**

   (ii) Standardize the return $x = 6$ and state how many standard deviations the return is above or below the mean.   **(3 Marks)**

   (Total 20 Marks)

QUESTION FOUR

(a)   Define the term 'correlation'.   **(1 mark)**

(b)   The data below relates to the number of privately owned cars and road accidents for the population of ten districts.

Cars per 100 people x	37	38	39	37	53	30	26	42	47	53
Road accidents per '000' people	35	19	35	28	37	31	25	26	28	35

   Required:

   (i) Calculate the Spearman's Rank Correlation Coefficient.   **(8 Marks)**

   (ii) Comment on the result obtained in (b) (i) above.   **(2 Marks)**

(c)   A red paper processing factory had the following data about output ('000' of tons) and the expenditure on energy (Frw '000') over a period of 8 months.

Output (x)	27	28	23	25	30	22	27	31
Expenditure (y)	73	77	65	80	79	98	90	85

   Required:

   (i) Draw a scatter diagram for the data above.   **(3 Marks)**

   (ii) Calculate the mean point of the data and plot it on a graph.   **(4Marks)**

   (iii) Draw a regression line which passes through the mean point.   **(2 Marks)**

   (Total 20 Marks)

QUESTION FIVE

(a)   Define the term 'forecasting'.   **(2 Marks)**

(b)   Annual air ticket sales in Kigali (in '000' passengers) are shown in the table below

Year	Quarter			
	Q1	Q2	Q 3	Q4
1	44	80	120	60
2	52	88	126	62
3	60	98	140	68

Required:

    (i) Use the least squares regression method to calculate the trend line and seasonal variation. **(12 Marks)**

    (ii) Show the original data and the trend line on the same graph. **(6 Marks)**

(Total 20 Marks)

QUESTION SIX

(a) Mr. Makuza deposited Frw 400,000 on a savings account for 3 years at a simple interest rate of 12.5% per annum. Afterwards, he wished to have deposited the same amount on a fixed account where money is compounded at 15% per annum.

  Required:

    (i) Calculate the simple interest on his savings. **(2 Marks)**

    (ii) Calculate the compound interest using straight line method. **(7 Marks)**

    (iii) Determine the loss or gain if he had deposited the amount on fixed deposit account.

(1 Mark)

(b) Bakunda Laundry Services would like to purchase a new washing machine in 2 years' time. The machine is expected to cost Frw 2,800,000. Bakunda has planned to create a sinking fund for this project.

  Required:

  Calculate the amount they should save every month and deposit on an account that pays 2% per month in order to raise all the needed funds. **(4 Marks)**

(c) A family is planning to acquire a loan purchase a house in a Kigali suburb valued at Frw 28,000,000. The family has planned to repay the loan in equal monthly installments over a period of 8 years at a bank interest rate of 18 % per annum (p.a) compound interest.

  Required:

    (i) Determine the monthly installment. **(4 Marks)**

    (ii) Calculate the interest charged on the loan. **(2 Marks)**

(Total 20 Marks)

QUESTION SEVEN

(a) Define the term 'Net Present Value'. **(1 Mark)**

(b) An investor has two investment projects in Kigali each with the same initial capital outlay of Frw 1,000,000 million. The expected net revenues on the respective projects over five years are outlined below (Frw).

Year	Project A	Project B
0	-1,000,000	-1,000,000
1	410,000	400,000
2	550,000	500,000
3	360,000	400,000
4	320,000	380,000
5	450,000	420,000

Required:

(i) Calculate the discount factor for the respective years using a 15% rate of discount.   **(5 Marks)**

(ii) Calculate the discounted cash flow (DCF) for each project. NB: Set out your answer in the form of a discounted cash flow table.   **(10 Marks)**

(iii) Calculate the Net Present Value (NPV) for each project.   **(2 Marks)**

(iv) Advise on which project to be retained.   **(2 Marks)**

(Total 20 Marks)

End of question paper

Present value interest factor of $1 per period at i% for n periods, PVIFA (i,n).

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.818	9.129	8.514

Present value interest factor of $1 per period at i% for n periods, PVIFA (i,n).

Period	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870

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