25.12.2021

TEVETA

Technical Education, Vocational and Entrepreneurship Training Authority

CERTIFICATE IN COMPUTER STUDIES

LEVEL 4 EXAMINATIONS

FINAL INTEGRATED SUMMATIVE EXAMINATIONS

SITTING: DECEMBER 2021

SUBJECT: BUSINESS MATHEMATICS AND STATISTICS

TIME: THREE (3) HOURS **TOTAL MARKS 100**

PASS MARK: 50

INSTRUCTIONS

1. Write your examination number and National Registration Card number on the answer Booklet provided. Ensure to append your signature in the space provided on the answer booklet.
2. Write your answer SCRIPT SERIAL NUMBER on the examination register provided and the entry slip.
3. There are SEVEN (7) questions in this paper.
4. Attempt any FIVE (5) questions of your own choice.
5. Cell phones and programmable calculators are NOT allowed in the examination room.

DO NOT TURN THIS PAPER UNTIL YOU ARE TOLD TO DO

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QUESTION 1

(a) Differentiate the function $f(x) = 2x^2 + 3x$ (3 marks)

(b) Solve the equation $2(5^{2x})-5^{x}=6$ (5 marks)

(c) Given that the probability density function (pdf) of a normal distribution is given by the formula $f(x) = \frac{1}{\delta\sqrt{2\pi}} e^{-\frac{1}{2}(\frac{x-\mu}{\delta})^2}$ take the standard deviation ($\delta = 4$), the population mean (μ=2) and π=3.124

(i) Find $f(4)$ (8 marks)

(ii) State the Central Limit Theorem under normal distribution (4 marks)

(Total: 20 Marks)

QUESTION 2

(a) A company manufactures two types of phones Android brand (X) and Apple brand (Y), on which its aim is to maximise profit. The company wish to know the idea combination of X and Y. All the electronic components are produced in three stages: Assembly, Inspection & Testing, and Packing. Basic requirements are as shown in the table below;

Product	Assembly	Inspection & testing	Packaging
X	1	1	3
Y	2	4	20
Maximum available. (hours)	600	60	3600

The profit per product X is k10 and Y is k15.

(i) State the objective function. (5 marks)

(ii) State the constraints as functions. (5 marks)

(b) A concrete mixture includes: 65kgs stones, 115kg sand and 55kg quarry dust. Calculate the percentage composition of the quarry dust. (6 marks)

(C) Simplify $\log_a 4 + \log_a 3^2 + \log_a 9 \div \log_a 6$ (4 marks)

(Total: 20 Marks)

QUESTION 3

(a) Births at the hospital occur randomly at an average rate of 1.8 births per hour. Calculate:

(i) the probability of observing 4 births in a given hour at the hospital. (6 marks)

(ii) the mean value of observing a birth at the hospital. (2 marks)

(iii) the variation(variance) of observing a birth at the hospital. (4 marks)

(b) Solve the following system of equation elimination method.

$$2x + y - z = 1$$
$$x + 3z = 2$$
$$-3x - y + z = -1$$

(8 marks)

(Total: 20 Marks)

QUESTION 4

(a) To find the derivatives of a function of functions, we need to apply the chain rule:

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

Find $\frac{dy}{dx}$

(i) $y = (x^2 + 3)^5$ (5 marks)

(ii) $y = \sqrt{4x^2 - x}$ (5 marks)

(b) The accrued amount formula (simple interest) is given by:

$$A_n = P(1 + i)^n$$

(i) Make P the subject of the formula (5 marks)

(ii) If some principal amount is invested at 12% and amounts to K4917.25 after 3 years. Calculate the principal amount. (5 marks)

(Total: 20 Marks)

$P(x=4)\ \frac{e^{-m} m^x}{x!}$ $\frac{A_n}{(1+i)^n} = \frac{P(1+i)^n}{(1+i)^n}$ $P = \frac{4917.25}{(1+0.12)^3}$

$= \frac{e^{-1.8} \times 1.8^4}{4!}$ $P = \frac{A_n}{(1+i)^n}$ $P = \frac{4917.25}{1.404928}$

$= \frac{6.049647464 \times 10.4976}{0! \ 1 \ 2 \ 3 \ 4}$ $P = 3500.001424$

$= K3500$

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QUESTION 5

(a) Consider the variables in the table below

X	6	8	9	12	10
Y	3.5	4.3	5.2	5.8	6.4

(i) Fit a regression line $y = a + bx$
Where $a = \bar{y} - b\bar{x}$ and $b = \frac{\frac{1}{n}\sum x_i y_i - \bar{x}\bar{y}}{\frac{1}{n}\sum x_i^2 - (\bar{x})^2}$ (8 marks)

(ii) Find the value of y if x increased by 0.75 (2 marks)

(b) Simplify the following expressions

(i) $(\alpha - \beta)(\alpha^2 + \alpha\beta + \beta^2)$ (5 marks)

(ii) $(\alpha - \beta)(\alpha + \beta)$ (5 marks)

(Total: 20 Marks)

QUESTION 6

(a) Compute the mean, variance and the standard deviation for the earnings for share data using the grouping shown in the frequency table below:

Class	Mid-value	Frequency	$f(x)$	f_x^2
0-10		3		
10-20		4		
20-30		6		
30-40		10		
40-50		7		
		$n = \sum f_i = 30$		

From the table above, compute

(i) the mid-values, f(x) and fx^2 for each class (4 marks)

(ii) The mean of the earnings (2 marks)

(iii) The standard deviation for the earnings (4 marks)

(b) Ten competitors in a beauty contest where ranked by two judges as shown in the table below

First judge	1	6	5	10	3	2	4	9	7	8
Second judge	3	5	8	4	7	10	2	1	6	8

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Find the correlation coefficient between the rankings using Spearman's rank correlation (10 marks)

(Total: 20 Marks)

QUESTION 7

(a) Mr. Wiseman had some money which he wanted to convert in different currency thus, he entered the exchange rate shop and found the following rates:

1 Rand = K6 1 Dollar = K8 1 Pound = K9.5

Convert:

(i) $6,200 USD to Pound (4 Marks)
(ii) $1,400 Pound to Rand (3 Marks)
(iii) 8,000 Rand to Dollar (3 Marks)

(b) The following data relate to a set of commodities used in a particular process

commodity	2005		2006	
	Price (K)	Quantity (Units)	Price (K)	Quantity (Units)
A	36	100	40	95
B	80	12	90	10
C	45	16	41	18
D	5	1100	6	1200

Calculate Laspeyres and Paasche price indices for 2006 taking 2005 as base year. (10 marks)

$L = \frac{\Sigma P_1 q_0}{\Sigma P_0 q_0}$ $P(P) = \frac{\Sigma P_1 q_1}{P_0 q_1}$

(Total: 20 Marks)

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