GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

Business Mathematics 3
7020

JUNE 2022 **ADVANCED LEVEL**

Specialty Name and Acronym	**Commercial Specialties Except HEC**
Subject Title	**Business Mathematics**
Subject Code No.	**7020**
Paper No.	**3**

Duration: 3 Hours

INSTRUCTIONS TO CANDIDATES

Answer any FIVE questions.

Show all steps in your calculations, giving the answer at each stage.

Use calculators, statistical formulae and financial tables where appropriate.

You will be provided with graph paper(s) where necessary.

You are advised to read carefully through the question paper before you begin your answers.

You are reminded of the necessity for good English and orderly presentation in your answers.

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1. a) What do you understand by
   i) Linear regression
   ii) Coefficient of determination **(2 Marks)**

b) The following table gives the ages and blood pressure of women

Ages (x)	56	42	36	47	49	42	60	72	63
Blood Pressure (y)	147	125	118	128	145	140	155	160	149

i) Calculate and comment on the Pearson Product Moment Correlation Coefficient.
ii) Determine the equation of the least squares regression line between blood pressure on ages of women (x/y).
iii) Estimate the blood pressure of a woman whose age is 45 years. **(18 Marks)**

(Total = 20 marks)

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2. a) State two characteristics of the Binomial distribution **(2 Marks)**
b) The rate of defectiveness of items from a production line is 2%. Five items are randomly selected from the production line. Find the probability that:
   i) Exactly two items are defective
   ii) At least two items are defective
   iii) At most two items are defective **(11 marks)**
c) Given that 100 items were randomly selected instead, use the Poison appropriation to the Binomial distribution and calculate the probability that;
   i) three items are defective
   ii) less than three items are defective **(7 marks)**

(Total = 20 marks)

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3. a.) A bag contains 5 white balls and 7 green balls. Two balls are drawn, one after the other and without replacement.
   i) Draw a tree diagram to represent the above information
   ii) If the first ball drawn is white, find the probability that the second ball is green.
   iii) Find the probability that the two balls are of the same colour **(8 marks)**

b) X is a discrete random variable with mean 6.0. Its distribution is given below

X	1	**m**	6	8	12
$P(X = x_i)$	0.1	0.3	0.2	**n**	0.15

Calculate:
i) the values of **m** and **n**
ii) the variance of x
iii) $P(X < 8)$ **(12 marks)**

(Total = 20 marks)

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4. a) The following data relates to the distribution of the masses (to the nearest kg) of 60 girls in a school.

Mass(kg)	30-34	35-39	40-44	45-49	50-54	55-59
Frequency	3	X	18	Y	12	2

The value of X is one- quarter that of Y

i) Determine the value of X and Y. **(3 marks)**
ii) Determine the modal class and estimate the mode. **(6 marks)**
iii) Determine the median. **(3 marks)**
iv) Calculate the mean and the standard deviation of the distribution. **(5 marks)**

b) A second sample of 40 students is selected and is found to have a mean mass of 42kg and a standard deviation of 4 kg.
Calculate the mean of the masses of the combined 100 students. **(3 marks)**

(Total = 20 marks)

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5. The following data apply to sporting goods

	2014		2015		2016	
	Price (in 000 FCFA)	Quantity	Price	Quantity	Price	Quantity
Skis	210	10	231	10	252	15
Tents	300	5	270	6	300	7
Rifles	300	5	330	5	360	5
Golf Clubs	450	5	540	5	540	5

a) Calculate the Laspeyres Index for 2015 and 2016 using 2014 = 100 **(10 marks)**
b) Using 2014 = 100, calculate the Paache index for 2015 and 2016 **(10 marks)**

(Total = 20 marks)

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6. The following data shows the relationship between the number of fraud committed **(y)** and the amount of money spent on fighting fraud (x) FCFA

x	15	20	35	40	25	50	60	65
y	70	45	45	40	35	20	10	5

Required:

a) Using the Pearson's correlation coefficient what can you say about the relationship between x and y? **(8 marks)**
b) Derive the linear regression line: $y = a + bx$ using the least squares method **(6 marks)**
c) Determine the number of frauds committed if the amount spent on fighting fraud is 100 FCFA **(2 marks)**
d) Determine and interpret the coefficient of determination. **(4 marks)**

(Total = 20 marks)

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7. a) A random sample of 81 oranges is drawn from a bag known to follow a normal distribution. The mean weight of the oranges is 0.752 and the standard deviation is 0.03. Determine a 95%

confidence interval for the population mean weight of the oranges. **(6marks)**

b) From past records, the probability that a machine will produce defective during a day's production is given as 0.2. If 6 items are produced in a particular day, find the probability that:

i) No defective item is produced **(4 marks)**

ii) 4 or more defective items are produced **(8 marks)**

iii). What is the expected number of defective items produced? **(6 marks)**

(Total = 20 marks)

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8. a) Distinguish between type I and type II errors **(4 marks)**

b) Study the following table showing the time taken for travels by two airlines – Air Ngie and Air Bafut to know which airport is more efficient using 5% level of significance.

Statistics	Air Ngie	Air Bafut
Average Time	3.56	3.36
Standard deviation	0.08	0.12
Number of trips	50	50

Required

i) State the hypothesis of the test **(2 marks)**

ii) Conduct the test **(4 marks)**

iii) Make a decision and draw a conclusion **(2 marks)**

c) In Balalast LTD, the Human Resource Manager believes that the average employee weekly wage for the company is 100,000 FCFA with a standard deviation of 25,000FCFA. To verify this, a sample of 25 employees was selected and the average wage obtained was 99,000 FCFA. Use a 5 percent level of significance, to validate the claim of the Human Resource Manager. **(8 marks)**

(Total = 20 marks)
