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CHRISTIAN SERVICE UNIVERSITY COLLEGE

KUMASI

CSUC SCHOOL OF BUSINESS

DEPARTMENT OF ACCOUNTING & FINANCE

BACHELOR OF BUSINESS ADMINISTRATION

End of First Semester Examination, 2019/2020 Academic Year

JANUARY ADMISSION

Level 200

CSUC 201: QUANTITATIVE METHODS

JUNE, 2020 **[110 marks]**

INSTRUCTIONS TO CANDIDATES:

- **Answer TWO Questions only. Question ONE and any other question**
- **Write your answer on the answer sheets provided**
- **Your answer for EACH QUESTION should be FOUR (4) pages minimum.**
- **Write your index number clearly at the top of every page of the answer sheets used.**

Note: Marks will be awarded for:

- Introduction
- Content
- Conclusion
- Evidence of Further Reading
- Originality and Independence (Cheating would be penalized and integrity rewarded)
- Correct grammar, clarity of expression and logical presentation of facts.
- Answers to questions must be well referenced.

Examiner: Osei-Anim Reindolph

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QUESTION ONE

A. Evaluate $\int_1^2 \frac{(x+1)(x^2-2x+2)}{x^2}\,dx$ **[3 marks]**

B. The total cost of manufacturing x items is $c(x) = x^3 + 11x^2 + 40x + 10$. Find the marginal cost at a production level of 50. **[3 marks]**

C. In marketing a certain product, a business has found out that the demand for the items produced is represented by the function

$P(x) = \frac{55}{\sqrt{x}}$

The cost of producing, X items is given the function $c = 0.4x + 700$

Find the price per unit that gives the maximum profit. **[10 marks]**

D. If $y = (x^3 + 2x)^5$ prove that $\frac{dy}{dx} = 15x^2(x^3 + 2x)^4 + 10$ **[5marks]**

E. Solve the quadratic function $3x^2 + 12x - 36 = 0$ **[5 marks]**

F. Consider the data set below and use it to answer the questions which follow 3, 8, 12, 16, 13, 5

i. Calculate the arithmetic mean **[3 marks]**

ii. Harmonic mean **[3 marks]**

iii. Geometric mean **[3 marks]**

G. Calculate the future value on GH¢50,000 at an annual rate of 12% compounded semi-annually for a period of 4 years **[3 marks]**

H. Consider the following sample data set

8 2 6 x 5

If the value of the sample mean is 6

i. Calculate the value of x **[3 marks]**

ii. Compute the sample variance **[3 marks]**

iii. Calculate the standard deviation **[3 marks]**

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I. Suppose that $x_1 = 7$ $x_2 = 3$ $x_3 = 1$

$x_4 = 0$ $x_5 = -6$ and $y_1 = -3$

$y_2 = 5,$ $y_3 = -8$ $y_4 = 9$ $y_5 = 1$

Calculate the following question

i. $\sum_{i=2}^{1=4} 2y_i$ **3marks**

ii. $\sum_{i=1}^{1=3} 4(x_i^i - 1)$ **3marks**

iii. $y_1^2 + \sum_{i=3}^{1=5} (xi^2 + 2y_i^2)$ **3marks**

J. i. If $a + b + c = 0$ prove that

$$\frac{1}{1+x^a+x^{-b}} + \frac{1}{1+x^b+x^{-c}} + \frac{1}{1+x^c+x^{-a}} = 1$$ **2marks**

ii. Given that $y = 2^x$

δ. Show that $4^x = y^2$ **2marks**

β. Express 2^{x-1} in terms of y **2marks**

α. By using your answers to part, δ or otherwise, find the values of x for which $4^x - 9(2^{x-1}) + 2 = 0.$ **2marks**

K. The variable x takes the values 1,2,3 and 5 according to the following distribution

X	1	2	3	5
P(x)	01	0.3	0.4	0.2

i. What is the probability that x is negative? **[2marks]**

ii. Find E(x), the expected value of x **[2 marks]**

iii. Find the probability that $x^2 > 8$ **[2 marks]**

QUESTION TWO

Students who apply to MBA programs must write the graduate management admission test (GMAT). University admission committees use the GMAT score as one of the critical indicators of how well a student is likely to perform in the MBA program. However, the GMAT may not be a very strong indicator for all MBA programs. Suppose that an MBA program designed for middle managers who wish to upgrade their skills was launched 3 years ago. To judge how well the GMAT score produces MBA performance, a sample of 12 graduates, was taken. Their grade point average in the MBA, program (values from 0 to 12) and the GMAT score (values from 200 to 800) listed in the table below.

GMAT (X)	GPA (Y)
599	9.6
689	8.8
584	7.4
631	10.0
594	7.8
643	9.2
656	9.6
594	8.4
710	11.2
611	7.6
593	8.8
683	8.0

Note:

$$\text{COV } (x, y) = \frac{1}{n-1}\left[\sum_{i=1}^{n} x_i y_i - \frac{\sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i}{n}\right]$$

$$\text{Coefficient of correlation } r = \frac{cov(x,y)}{s_x y_x}$$

Where s_x and s_y are the standard deviations of x and y.

A. Compute

i.	Covariance	**[15marks]**
ii.	Coefficient of correlation	**[10 marks]**
iii.	Interpret your findings	**[5marks]**

B. Estimate the least square line using least square method $\hat{y} = b_0 + b_1 x$

Least squares line coefficients

$b_1 = \frac{Cov(x,y)}{s^2 x}$

$b_0 = \bar{y} - b_1 \bar{x}$ **[10marks]**

QUESTION 3

A. The following data is a frequency distribution of the monthly consumption of electricity of 68 consumers of a locality.

Monthly consumption	Number of consumers
$68 - 85$	4
85 – 105	5
105 – 125	13
125 – 145	20
145 – 165	14
165 – 185	8
185 – 205	4

Use the data above to deduce

i. Mean **[3 marks]**
ii. Median **[3 marks]**
iii. mode **[3marks]**
iv. Standard deviation **[3 marks]**
v. Compute the geometric mean **[3marks]**
vi. Coefficient of variation **[3marks]**

B. Compute the geometric mean where $GM = antilog\left[\sum_{i=1}^{n} \frac{f \log x}{n}\right]$ **[2 marks]**

C. Orchestra Company produces wrist watches. The company has identified its production function as $C(X) = 40{,}000 + 300x + x^2$

Deduce the following using the above cost function

i. Cost, average and marginal cost at a production level of 1000 units **[5marks]**
ii. The production level that will minimize average cost **[3 marks]**
iii. Minimum average cost **[2 marks]**

D. Given the demand and cost functions below, compute the number of units X whose level of production maximizes profit

Demand function: $P = 3000 - 2x$

Cost function: $C = 1200x + 2600$ **[3 marks]**

E. Given that $y = \frac{1}{3}x^3 - 2x^2 + 3x$. Find the maximum and minimum values of y. **[7marks]**

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QUESTION 4

A. Lakamuun is a business woman who operates three shops at Osino, Saaman and Dwenase all in the fanteakwa district. Laka as she is affectionately called by her customers deals in three items at each of the shops: Koko burger, bread and koose. The estimated demands for koko burger in the cups are ***40, 100 and 75*** for Osino, Saaman and Dwenase shops respectively. Each cup of Koko Burger bought at Osino goes with a loaf of bread and two koose while that of Saaman goes with one loaf of bread and three koose. In Dwenase each Koko burger goes with two loaves of bread and no koose. The total cost of operating the shops are GH¢160 GH¢450 and GH¢300 respectively.

i. What is the matrix representation of Lakamuun's problem **[7 marks]**

ii. What is the break-even price of Koko burger, a loaf of bread and koose? **[5 marks]**

iii. What is the total revenue for each product? **[5 marks]**

B. Find the effective interest rate equivalent to an annual rate of 8% compounded.

i. Semi-annually **[1mark]**

ii. Quarterly **[1 mark]**

iii. Monthly **[1 mark]**

C. Orchestra a manufacturer estimate, that when X units of a particular commodity are produced, the total cost will be $c(x) = \frac{1}{8}x^2 + 3x + 98$ [Thousand cedis] and that $P(x) = \frac{1}{3}(75 - x)$ [Thousand cedis] per unit is the price at which all x units will be sold.

i. Find the marginal cost and marginal revenue functions **[3 marks]**

ii. Find the number of units to be produced to maximum profit **[3 marks]**

iii. Find the maximum profit **[3 marks]**

D. Abuskelenke has determined that the marginal revenue function for one of its product is $R^1(x) = MR$ in cedis. X is the number of units of the product that are produced and sold. Given that the total revenue is zero when no units are produced and sold, determine

i. The total revenue function **[3 marks]**

ii. Compute the total revenue in thousands of cedis for a production level of 50 units **[4 marks]**

E. If $\frac{dy}{dx} = 3x^2 + 4x - 5$ and $y = -4$ and $x = 1$. Find y in terms of x. **[4marks]**