



PAN AFRICA CHRISTIAN UNIVERSITY

END OF TERM EXAMINATION

BCM105: QUANTITATIVE TECHNIQUES

FRIDAY JULY 1ST, 2014

0800HRS – 1100HRS

INSTRUCTIONS

- This exam paper has **Five** Questions
- Answer **Any Four** Questions
- Write your **student number** on the answer booklet provided.
- Read all questions carefully before attempting.

QUESTION ONE

a) Differentiate the following functions:

i) $y = 6x^4 - 12x^3 + 4x^2 - 7$ (2 marks)

ii) $y = \frac{(7x^3 - 3x)}{2x^2 - 3}$ (4 marks)

iii) $y = (4x^4 + 16x^3 - 18x^2)^{24}$ (4 marks)

b) A car selling firm has determined through regression analysis that its sales (S) are a function of the amount of advertising (measured in units) in two different media. This is given by the following relationship:

$$S(x,y) = 200x + 100y - 10x^2 - 20y^2 + 20xy$$

Where: x = Newspaper and
 y = Magazines

Required:

Determine the firm's optimal level of sales. (10 marks)

QUESTION TWO

a) Integrate the following functions:

i) $\int (10X^4 - 4X^3 - 6X^2 - 2X - 4) dx$ (3 marks)

ii) $\int (-3x^8 + 3x^5 - 14x^6) dx$ (3 marks)

b) Identify the stationary/turning points of the following functions and state whether they are maximum or minimum turning points:

i) $y = 4x - x^2$ (4 marks)

ii) $y = 2x^2 - 4x - 5$ (4 marks)

c) The profit function of two products A and B is given by $\Pi = 60x + 150y - x^2 - 3y^2$ where x is the number of units of A and B sold respectively.

Required:

i) Determine the values of x and y that will maximize profits (4 marks)

ii) Compute the maximum profit (2 marks)

QUESTION THREE

a) A firm finds that the marginal revenue is given by the expression $20 - 2q$ while the marginal cost is given by the expression $4q - 10$. Its fixed costs are Sh.30. q represents quantities of output produced and sold.

Required:

- (i) Total revenue, total cost and profit functions. (6 marks)
- (ii) Output and price that maximizes profit and the maximum profit. (6 marks)
- (iii) Breakeven output. (4 marks)

b) Determine the equation of the curve passing through the point (0,4) if its derivative $\frac{dy}{dx} = 3x^2$
(4 marks)

QUESTION FOUR

a) XYZ audit firm claims that among their 200 clients, 106 had computerized and manual, and 23 had neither on regular basis

Required:

Determine whether the above figures are compatible? Explain your answer

(8 marks)

b) A study by Excel consultants of the characteristics of 100 jua kali enterprises which had failed in business revealed that 95 of them either were undercapitalized, had inexperienced management or had poor location. 4 of the enterprises had all the three characteristics. 40 were undercapitalized but had experienced management and good location. 7 were undercapitalized and inexperienced management. 9 were undercapitalized and had poor location. 15 had inexperienced management but sufficient capitalization and good location. 10 had inexperienced management and poor location.

Required:

What did Excel consultant find to be the most prevalent characteristic for business failure in jua kali?

(12 marks)

QUESTION FIVE

a) Solve the following using factorization:

i) $x^2 - 5x + 6 = 0$ (4 marks)

ii) $4x^2 + 12x + 9 = 0$ (4 marks)

b) In each of the expressions. Fill in the missing term to make it a perfect square:

i) $25x^2 + 40x + \underline{\hspace{1cm}}$ (3 marks)

ii) $36x^2 - \underline{\hspace{1cm}} + 25$ (3 marks)

c) Given the two roots generate the underlying equation:

i) $(-3, 5)$ (3 marks)

ii) $(-2, 2)$ (3 marks)