



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2009/2010

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

(INFORMATION TECHNOLOGY)

SIT 404: MANAGEMENT MATHEMATICS.

DATE: Monday 19th July 2010

TIME: 8.00a.m – 10.00a.m

INSTRUCTIONS

Answer Question 1 and any other TWO Questions.

Question 1 (30 marks)

- a) Determine from first principles the derivative of the functions,
- i) $P = 10q + 12$
- ii) $C = 5x^2 + 100$ (4 marks)
- b) Derive the equation of a line passing through (0, 9) and (8, 12). (3 marks)
- c) Solve the equations.
- i) $8q^2 + 8q + 11 = 0$
- ii) $5x^2 - x - 33 = 0$ (4 marks)
- d) Solve the following system of simultaneous equations.
- $$2x + z = 6$$
- $$x + z = 2$$
- (5 marks)
- e) Sketch the graphs of the following functions, on the same graph.
- $$f(x) = -x^2 - x, \quad f(x) = x^2 - 1$$
- (5 marks)
- f) i) The price per share for a quoted item is Ksh. 50 in the year 2008 and Ksh. 65 in the year 2009. Assuming a linear relation between price per share time quoted; find the relation between price per share and time. (4 marks)

ii) Using the equation found above predict, the price per share in the year 2010.

(2 marks)

g) Evaluate the given integral,

$$\int \frac{12x^2}{4x^3+5} dx$$

(3 marks)

Question 2 (20 marks)

a) i) Derive the equation of a line passing through the point (-2, 6) and is parallel to the line $x + 2y = 5$.

(3 marks)

ii) Determine the Equation of the line perpendicular to but with the same x – intercept as the line $2x + 6y = 14$.

(3 marks)

b) Given a cost function $C = 25q + 700$ and $R = 5q$ find,

i) The profit function P.

ii) The Marginal revenue, Marginal cost and Marginal profit.

(4 marks)

c) A stock broking has the following revenue (R) and cost (C) functions: $R = 100q$ and $C = 5q^2 + 15q + 500$. Determine the break-even point, sketch the C and R functions and on the same graph and indicate the BEP (break even point)

(5 marks)

d) The supply of an item is $p = 64 + 32q + 4q^2$ while the demands function by $p = 1744 + 24q - 12q^2$.

i) Determine the equilibrium quantity and price,

ii) Sketch the Equilibrium analysis chart.

(5 marks)

Question 3 (20 marks)

a) A cost function is given by $C = Q^2 - 30Q + 20$ where Q is the quantity of units produced. Find the point of minimum cost.

(3marks)

- b) A firm selling a trade directory has developed a profit function as follows,

$$P = 9D - 0.0005D^2 + 0.06DA - 80A^2 - 5000$$

Where D = number of directories sold, and

A = number of advertising pages

How many directories containing how many advertising pages should be sold to maximize profits?

(6 marks)

- c) Given $TR = -45q^2 + q + 100$, and $TC = q^3 + q^2 + 100q$, find,

- TR and TC at $q = 100$.
- The Marginal revenue and Marginal cost.
- The Marginal cost.

(6 marks)

- d) It is known that the number of units demanded is given by $p = (25 - 4q)$. Find,

- The Total revenue function, TR
- The Marginal revenue, MR at $q = 10$.

(5 marks)

Question 4 (20 marks)

- a) Compute the following limits,

i) $\lim_{x \rightarrow 1} \left\{ \frac{x^2 - 1}{x - 1} \right\}$

ii) $\lim_{x \rightarrow \infty} \left\{ \frac{-2x^2 + 2}{3x + 1} \right\}$

(6 marks)

- b) Find the points of discontinuity of each of the functions if any:-

i) $y = \begin{cases} x + 2 & x > 2 \\ x & x \leq 2 \end{cases}$

ii) $y = \frac{x^2 - 4}{x^2 - 3x + 2}$

(6 marks)

- c) Show that for compound interest the relationship between the amount accruing (future value) A_n , principal P , and time t and rate r is given by $A_n = P(1 + r)^n$. (4 marks)

- d) Draw the graph of the inequality below simultaneously and show the wanted region.

$$\begin{cases} x + 2y \geq 4 \\ y \geq 0 \\ x \geq 2 \end{cases}$$

(4 marks)

Question 5 (20 marks)

- a) Given $Z = x^5 + 4xy^2 + \sqrt{y}$; find,

i) $\frac{\partial Z}{\partial x}$

ii) $\frac{\partial Z}{\partial y}$

iii) $\frac{\partial^2 Z}{\partial xy}$

(6 marks)

- b) Given $Z = 12x^2 - 18x - 6xy - 14y + 10y^2$, determine the critical values and test the nature of optimality of the function at these points.

(6 marks)

- c) Evaluate the following integrals;

i) $\int (x+2)(x^2+3x-1)dx$

ii) $\int_{x=1}^{x=2.5} (2x^2+9x)dx$

(4 marks)

- d) Assume that a company has a marginal profit function given by $y = 100 - 2x$, where y is in £s and x is the sales in units. If the company breaks even on sales of 5 units. What are the fixed costs of the company?

(4 marks)