



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF BUSINESS ADMINISTRATION

FIRST YEAR SPECIAL/ SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF COMMERCE

BMS 100: MANAGEMENT MATHEMATICS I

DATE: 26/3/2021

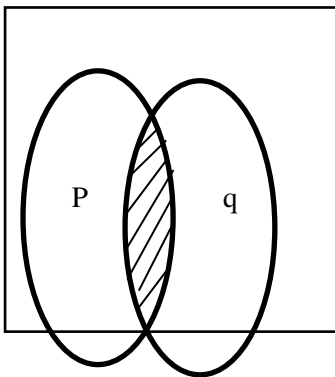
TIME: 8.30-10.30 AM

INSTRUCTIONS:

Answer Question ONE and any other TWO Questions.

QUESTION ONE

- a) What does the shaded portion of the venn diagram represent? (Explain your answer)



(2 marks)

- A. Not P
B. P or q
C. Not q
- b) Power set of empty has exactly _____ subset (Explain your answer) (2 marks)
- A. One
B. Two
C. Zero
D. Three

- c) What is the cardinality of the power set of the set $\{0,1,2\}$ (Explain your answer) (2 marks)
- A. 8
 B. 6
 C. 7
 D. 9
- d) Mark the following statements as either True or FALSE (6 marks)
- i. The empty set is a subset to every set
 ii. A set with two elements has more than two subsets
 iii. Second order conditions are sufficient to identify the nature of a turning point
 iv. $y = 10x^2 + 15e - 0.03$ is an exponential function
 v. A multi-variate function has more than one dependent variable
 vi. The first and necessary condition for a function to have a stationary point is that its first derivative must be zero: TRUE or FALSE
- e) A manufacturer can produce diskettes at a cost of kshs 50 per box of ten. She estimates that if she sells them for kshs r per box of ten, she will be able to sell $(600-r)$ diskettes per week. Assuming that the weekly profit is a function of the cost price, r .
 Find;
- i. An expression of the profit p as a mathematical function (3 marks)
 ii. Find $P(r)$ such that $r = 56, 70, 120$ (2 marks)
- f) Explain the difference between the following terms giving appropriate examples of each
- i. Discounted and non-discounted techniques (3 marks)
 ii. Set union and set intersection (3 marks)
- g) Briefly explain the concept of project appraisal highlighting the various aspect which encompasses the process (3 marks)
- h) Find $\frac{dc}{dq}$ given $C = \frac{(q^{2.5}+q)}{(q^3+q^2)}$ (2 marks)
- i) Find the area enclosed by $y = x^2 - 2x^2$ and the axis (5 marks)

QUESTION TWO (20 MARKS)

- a) Briefly explain the role of calculus in business and industry (4 marks)
- b) The production manager of a production firm gave the average cost function of the firm as $AC = \frac{1}{3}Q^2 + Q - 1$ while the revenue director stated the average revenue function of the firm as $AR = 1 - \frac{1}{2}Q + \frac{2}{3}Q^2$

Required

- i. Determine the profit function of the firm (4 marks)
- ii. Work out the levels of Q for which the profit is at maximum and minimum (6 marks)
- c) A firm's production function in terms of the number of workers (L) is given by

$$Q = 2L^2(3 - 0.1L)$$

Determine the size of the workforce (L) that maximized output and hence a graph of this production function (6 marks)

QUESTION THREE (20 MARKS)

- a) Find (i) $\frac{dp}{dq}$ for the function
- (i) $P = \frac{Q^3}{3} - \frac{2}{3}Q - 5Q - 3$ (2 marks)
- (ii) $\int Q(Q^2 + 2)^3 dQ$ (3 marks)
- b) A survey of 117 households was carried out at Rongai town to find out the number of households that watched television channels A, B, and C respectively the results of the survey are as follows
- 42 of the households watched channel A
 - 52 of the households watched channel B
 - 51 of the households watched channel C
 - 11 of the households watched both channel A and C
 - 17 of the households watched both channel B and C
 - 5 of the households watched the three channels

Required

- (i) Represent the above information in a Venn diagram (2 marks)
- (ii) The number of households which watched only one channel (3 marks)
- (iii) The number of households, which watched none of the three channels (3 marks)

- c) Discuss three advantages of IRR as a project appraisal technique (3 marks)
- d) Briefly explain the difference between general functions and specific functions (4 marks)

QUESTION FOUR (20 MARKS)

- a) Given that $\frac{dc}{dx} = 21 - 10x + x^2$ where C is the total cost (in millions) incurred in producing X items in a particular day.

Required:

- i. Determine the total cost function (2 marks)
- ii. Find the number of items X that should be produced in a day in order to minimize total cost (4 marks)
- iii. Work out the marginal cost when the total cost is at its minimum (2 marks)
- iv. A Firm intends to borrow ksh.1,000,000 to be invested in either project 1 or project 2.

Period	Project 1(ksh)	Project 2(ksh)
1	500,000	600,000
2	300,000	500,000
3	400,000	400,000
4	550,000	450,000
5	600,000	300,000

The cost of capital is 16% and the project has no salvage value. Using the following appraisal techniques advise the firm on which project to invest.

- a) Net Present Value (NPV) (6 marks)
- b) Profitability index (6 marks)

QUESTION FIVE (20 MARKS)

- a) Briefly explain the advantage of using NPV as an appraisal technique over the pay back period method (4 marks)
- b) Given the function $f(x) = ax^2 + bx + c = 0$; Justify using an acceptable method that

$$x = \frac{-b \pm \sqrt{b^2 + c^2}}{2a} \quad (5 \text{ marks})$$

The value of x is obtained as

- c) A manufacturing firm call sell Q quantities of match boxes that can produce in a year. The average cost of producing match boxes in a year is given by the function $AC = \frac{1}{3}Q^2 + Q - 1$

The demand function of the firm match boxes is estimated as $P = \frac{2}{3}Q^2 - 0.5Q + 1$

Required;

- i. Derive the total venue function (TR) (2 marks)
 - ii. The profit function (3 marks)
 - iii. The number of boxes that should be produced inorder to maximize profit (3 marks)
- d) Find the total area between the curve $y = x^3$ and the x - axis between $x = -2$ and 2 (3 marks)