



# MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF BUSINESS ADMINISTRATION

FIRST YEAR FIRST SEMESTER SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF COMMERCE

BMS 100: MANAGEMENT MATHEMATICS 1

**DATE: 24/9/2019**

**TIME: 2.00-4.00 PM**

**INSTRUCTIONS: ATTEMPT QUESTION ONE AND ANY OTHER TWO**

## **SECTION A**

### **QUESTION ONE (30MARKS)**

- a) Outline three applications of management mathematics in business (6 marks)
- b) A manufacturer makes two products Q and M. The cost of making 15 units of product Q and 10 units of product M is sh.600. The cost of making 5 units of product Q and 8 units of product M is sh. 340. The manufacturer makes a profit of 20% and 25% on each unit of product Q and M respectively.

#### **Required**

- i) Express the above cost of making one unit of product Q and M in simultaneous equations (2 marks)
- ii) Calculate the cost of making one unit of product Q and M (3 marks)
- iii) Calculate the selling price of one unit of product Q and M (3 marks)
- c) The revenues of a farmer may depend on two variables namely: the amount of fertilizer and also the type of natural soil. Let  $\pi = 30x^2y + y^2 + 50x + 60y$

where  $\pi$  = annual revenue in £000

x=type of soil

y=amount of fertilizer applied

### Required

Determine the rate of change of  $\pi$  with respect to  $x$  and  $y$  (6 marks)

d).250 members of a certain society have voted to elect a new chairman. Each member may vote for either one or two candidates. The candidate elected one who polls most votes. Three candidates  $x, y, z$  stood for elections and when the votes were counted it was found that :59 voted for  $y$ , 37 voted for  $z$  only, 12 voted for  $x$  and  $y$ , 14 voted for  $x$  and  $z$ , 147 voted for either  $x$  or  $y$  or both  $x$  and  $y$  but not  $z$ , 102 voted for  $y$  or  $z$  or both but not for  $x$

### Required

- (i) How many voters did not vote (4 marks)
- (ii) How many voters voted for  $x$  only (4 marks)
- (iii) Who won the elections (2 marks)

### QUESTION TWO 20 MARKS

a) Find the derivatives of

(i)  $y = 3x^2 + 5x + 7$  (2 marks)

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

(iii)  $y = (x^2 + 16x + 5)^2$  (4 marks)

b) A motorist travels from town A and B 390km apart, at an average speed of  $x$  km/h. On his return journey he increases his speed so that average speed increases from B to A by 13 km/h. If he takes less on his return journey, find the value of  $x$  (10 marks)

### QUESTION THREE 20 MARKS

a) Evaluate

(i)  $\int x^2 dx$  (2 marks)

(ii)  $5/(x+3)(x-2) = 3/(x+2)(x-2)$  (3 marks)

(ii)  $\int_1^3 (3x^2 + 3) dx$  (4 marks)

b) Your company manufactures large scale units. It has been shown that the marginal cost which is the gradient of the total cost curve is  $(92 - 2x)$  sh. in Thousands, where  $x$  is the number of unit of output per annum. The fixed cost are sh. 800,000 per annum. It has also been shown that the marginal revenue which is the gradient of the total revenue is  $(112 - 2x)$  shs. in thousands.

**Required**

- (i) Establish the integration of the equation of the total cost curve (2 marks)
- (ii) Establish by integration the equation of the total revenue curve (2 marks)
- (iii) Establish the break even situation for your company (2 marks)
- (iv) Determine the number of units of output that would
  - a).Maximize the total revenue (2 marks)
  - b).Maximize the total cost, together with the Maximum total revenue and total cost (3 marks)

**QUESTION FOUR (20MARKS)**

- a) Consider the following universal set T and its subjects C,D and E

$$T = \{0, 2, 4, 6, 8, 10, 12\}$$

$$C = \{4, 8\}$$

$$D = \{10, 2, 0\}$$

$$E = \{0\}$$

- Find
- (i)  $D \cap E$  (2 marks)
  - (ii)  $C \cup D$  (2 marks)
  - (iii)  $C \cap D \cap E$  (3 marks)
  - (iv)  $D \subset C \cup E$  (3 marks)

- b) Digital Ltd. Manufactures and sells floppy disks at Nairobi Industrial Area. The average total cost (ATC) and Average Revenue (AR) (in thousands of shillings) of producing x floppy disks are given by the following functions:ATC =

$$\frac{1}{2}x^2 - \frac{5}{2}x + 50 + \frac{500}{x}$$

$$AR = 800 - 2x^2$$

Where: x is the number of floppy disks produced

**Required:**

- i) The profit function (4 marks)
- ii) The number of floppy disks required to maximize profit (4 marks)
- iii) The maximum profit (2 marks)

**QUESTION FIVE ( 20 MARKS)**

- a) Solve using graphical method the following set of equations (5 marks)

i)  $2x+y=8$

$x+2y=10$

- ii) Solve and graph,  $3x-4 \leq 8+x < 2+7x$  (5 marks)

- b). The equation of a line AB passes through the points A(2,3) and B(-4,5)

Find

- i) The equation of the line (3 marks)
- ii) The gradient of the line (3 marks)
- iii) The y intercept (2 marks)
- iv) The value of y when  $x=1$  (2 marks)