



***"Investing in Africa's Future"***

**FACULTY OF MANAGEMENT AND ADMINISTRATION**

**COURSE TITLE: MMS 105 MATHEMATICS FOR BUSINESS II-(CONVENTIONAL)**

**SEMESTER II: FINAL EXAMINATION – NOVEMBER 2013**

**LECTURER : MR T MAKAMBWA**

**TIME 3 HOURS**

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***INSTRUCTIONS***

Answer all Questions in Section A and **any three questions from Section B**

Total possible mark is 100

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Start **each** question on a new page in your answer Booklet.

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The marks allocated to **each** question are shown at the end of the section.

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## Section A (40 Marks)

### QUESTION ONE

Differentiate

(a)  $Y = (2x + 1)^{10}$

(b)  $Y = (x^2 + 3x - 5)^3$

(c)  $Y = x^2(x + 5)^3$

(d)  $Y = x^5(4x + 5)^2$

(e)  $Y = \frac{x^2}{x^2 + 4}$

[15]

### QUESTION TWO

Integrate the following:

a)  $\int 30x^4 dx$

b)  $\int (24 + 7.2x^{-2}) dx$

c)  $\int 0.5/x dx$

d)  $\int (48x - 0.4e^{-1.4x}) dx$

e)  $\int (65 + 3^x) dx$

[15]

### QUESTION THREE

Given the supply function

$P = 10 + \sqrt{Q}$  find the price elasticity of supply

(a) Averaged along an arc between  $Q = 100$  and  $Q = 105$

(b) At the point  $Q = 100$

[5]

### QUESTION FOUR

If the supply equation is

$$Q = 150 + 5P + 0.1P^2$$

Calculate the price elasticity of supply

(a) Averaged along an arc between  $P = 9$  and  $P = 11$

(b) At the point  $P = 10$

[5]

## SECTION B( 60 Marks)

Answer **any** three questions

### QUESTION FIVE

- a) Find the consumers' surplus for the demand function  $p = 25 - x - x^2$  when  $p_0 = 19$ .
- b) The supply function for a commodity is  $p = x^2 + 4x + 5$  where  $x$  denotes supply. Find the producers' surplus when the price is 10.
- c) The demand and supply functions under pure competition are  $p_d = 16 - x^2$  and  $p_s = 2x^2 + 4$ . Find the consumers' surplus and producers' surplus at the market equilibrium price.

[20]

### QUESTION SIX

- a) The marginal cost function of manufacturing  $x$  units of a commodity is  $6 + 10x - 6x^2$ . Find the total cost and average cost, given that the total cost of producing 1 unit is 15.
- b) The marginal cost function of manufacturing  $x$  units of a commodity is  $3x^2 - 2x + 8$ . If there is no fixed cost find the total cost and average cost functions.
- c) If the marginal revenue for a commodity is  $MR = 9 - 6x^2 + 2x$ , find the total revenue and demand function.

[20]

### QUESTION SEVEN

- a). A school is preparing a trip for 400 students. The company who is providing the transportation has 10 buses of 50 seats each and 8 buses of 40 seats, but only has 9 drivers available. The rental cost for a large bus is \$800 and \$600 for the small bus. Calculate how many buses of each type should be used for the trip for the least possible cost

[10]

- b) A store wants to liquidate 200 of its shirts and 100 pairs of pants from last season. They have decided to put together two offers, A and B. Offer A is a package of one shirt and a pair of pants which will sell for \$30. Offer B is a package of three shirts and a pair of pants, which will sell for \$50. The store does not want to sell less than 20 packages of Offer A and less than 10 of Offer B. How many packages of each do they have to sell to maximize the money generated from the promotion?

[10]

### QUESTION EIGHT

- a) Find the general solution of the difference equation  $Y_{t+1} - 0.95Y_t = 1000$
- b) Find the particular solution, given  $Y_5 = 20950$ .
- c) Determine whether the system will stabilize and if so, what the stable value is. Plot the time to stability for  $t = 0$  to 10 in steps of one
- d) Solve the difference equation  $3Y_{t+1} + 2Y_t = 44(0.8)^t$  given  $Y_0 = 900$ .
- e) Show that the solution stabilizes and plot the time path to stability.

[20]

### QUESTION NINE

Find the inverse of the matrix  $A =$

$$\begin{bmatrix} 2 & 1 & 1 \\ 6 & 5 & -3 \\ 4 & -1 & 3 \end{bmatrix}$$

Hence or otherwise solve the equation

$$2x + y + z = 12$$

$$6x + 5y - 3z = 6$$

$$4x - y + 3z = 5$$

[20]

### QUESTION TEN

1. For each of the differential equations below (i) derive the definite solution, and (ii) use this solution to predict the value of  $y$  when  $t = 10$ .

(a)  $\frac{dy}{dt} = 0.2y$  with initial value  $y_0 = 200$

(b)  $\frac{dy}{dt} = 1.2y$  with initial value  $y_0 = 45$

(c)  $\frac{dy}{dt} = -0.4y$  with initial value  $y_0 = 14$

(d)  $\frac{dy}{dt} = 0.354y$  with initial value  $y_0 = 40$

[20]

### QUESTION ELEVEN

- a) Find an expression for the MC function given the the following average cost functions:

i)  $AC = 2Q + 5 + \frac{30}{Q}$

ii)  $AC = 3Q^2 - 4Q + 6 + \frac{100}{Q}$

In each case (i) state the value of fixed cost and variable cost ,and (ii) calculate the value of marginal cost when  $Q=50$ .

[10]

- b) The output for a firm over time is given by the function:

$$Q = \frac{t^3}{30} - \frac{t^2}{5} + \frac{3t}{10} + 12$$

$$30 \quad 5 \quad 10$$

- i) Determine the years in which the output is at maximum and minimum  
ii) Sketch the graph of  $Q$

[10]

END OF PAPER