MACHAKOS UNIVERSITY

University Examinations for 2016/2017 Academic Year

SCHOOL OF BUSINESS AND ECONOMICS

DEPARTMENT OF BUSINESS ENTREPRENEURSHIP AND MANAGEMENT SCIENCES

EXAMINATION FOR DIPLOMA IN EDUCATION

MATHEMATICS FOR ECONOMICS

DATE:5/12/2016 **TIME:**

INSTRUCTIONS.

Answer Question One and Any Other Two Questions

QUESTION ONE (30MARKS)

a) Explain the importance of the following branches of mathematics in economic analysis:
   i. Algebra
   ii. Geometry
   iii. Calculus (6marks)

b) The quantity of a commodity demanded is a function of its own price that is $Q = f(P)$, specified by the following equation:

$$Q = 9 - P$$

   i. Explain the meaning of the expression, $Q = f(P)$ (2Marks)
   ii. Find the values of $Q(0)$, $Q(4)$and $Q(6)$ (6marks)

c) Given the following sets A and B and the corresponding universal set T given by:

$$A = \{1, 2, 5\} \quad B = \{1,5,7,8\}$$

$$T = \{1,2,3,4,5,6,7,8,9,10\}$$

Determine

i. $A \cup B$
ii. $A \cap B$ (4marks)

d) Define the following terms as used in the study of functions:
   i. range
   ii. domain (4marks)

e) Consider the following demand function for some product given as:

$$P = 16 - 0.4Q$$

Find:

i. Total Revenue function
ii. Average Revenue function
iii. Marginal Revenue function
iv. the value Q for which $MR = 0$ (8marks)

QUESTION TWO

Employees have the choice of one of the three schemes A, B or C. They must vote for one but, if no preference can vote for all three or if against one scheme, they can vote for the two they prefer.

A sample poll of 200 voters revealed the following:

- 15 could vote for A and C but not B
- 65 would vote for B only
- 51 would vote for C only
- 15 would vote for A and B
- 117 would vote for either A or B, or A and B, but not C.
- 128 would vote B or C, or both B and C but not A.

How many would vote for:

i. all the three schemes?
ii. Only one Scheme?
iii. A irrespective of B or C?
iv. A only?
v. A and B but not C? (20marks)

QUESTION THREE

The demand and total cost function for a firm are given by:

$$P = 35 - 2Q$$

$$TC = 4Q^3 - \frac{21}{4}Q^2 + 49Q + 35$$

Find:

i. the level of Q and P that will maximize profits
ii. the level of Q that will maximize Total Revenue, TR
iii. the level of Q that will minimize Average Variable Cost, AVC
iv. the level of Q that will minimize Marginal Cost, MC.
v. the minimum AVC and MC (20marks)

QUESTION FOUR

A firm is said to be in equilibrium when producing at a level that corresponds with the lowest average cost, AC. given the total cost function as:

$$TC = 5 + 3Q - 2Q^2 + \frac{1}{2}Q^2$$

i. Determine the equilibrium output Q and the corresponding average cost
ii. sketch the graph of average cost against Q, taking 3 points above and 3 points (20marks)

QUESTION FIVE

A monopolist faces the following demand and cost functions given by:

$$P = 140 - 2Q$$

$$TC = 10 + 5Q^2$$

Where P = Price per unit of output

Q = Quantity produced and sold

a) Derive the profit function
b) Determine
    i. the level of Q to be produced and sold to maximize profit
    ii. profit-maximizing price
    iii. maximum profit
    iv. the level of Q that maximizes sales revenue
    v. the sales revenue maximizing price. (20marks)