MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR
FIRST YEAR SECOND SEMESTER

SCHOOL OF BUSINESS AND ECONOMICS
BSC. ECONOMICS, BSC. ECONOMICS AND STATISTICS & BSC. FINANCIAL ECONOMICS

COURSE CODE: ECO 1204-1
COURSE TITLE: MATHEMATICS FOR ECONOMISTS II

DATE: 4TH OCTOBER, 2021 **TIME: 1430 -1630 HRS**

INSTRUCTIONS TO CANDIDATES

Answer Question **ONE** and any other **TWO** questions

*This paper consists of **FOUR** printed pages. Please turn over.*

QUESTION ONE (20 MARKS)

a) Define the following terms:

i. Conditions of matrix singularity

ii. Inverse function rule

iii. Dynamic Analysis

iv. Polynomial vs rational functions **(2 Marks)**

b) Given the production function Q below, find the MPP_K and the MPP_L, are MPP_k and MPP_L, functions of *K* and L alone or are they functions of both *K* and *L?* **(3 Marks)**

$$\boldsymbol{Q = 124K^{0.75}L^{0.25}}$$

c) If the utility function of an individual takes the form:

$$\boldsymbol{U = U(x_1, x_2) = (x_1 + 2)^2(x_2 + 3)^3}$$

Where U is total utility, and x_1 and x_2 are the quantities of two commodities consumed.

i. Find the marginal utility function of x_1 and x_2 **(3 marks)**

ii. Find the value of the marginal utility of the two commodities when 4 units of each commodity are consumed. **(3 marks)**

d) Explain the economic meaning of the Hawkins-Simon Condition. **(1 marks)**

e) Find the inverse of matrix A.

$$\boldsymbol{A = \begin{bmatrix} 4 & 0 & 1 \\ 19 & 1 & 3 \\ 7 & 1 & 0 \end{bmatrix}}$$ **(5 marks)**

f) Solve the definite integral **(3 Marks)**

$$\boldsymbol{\int_3^{10} \frac{1}{4} x^8 dx}$$

QUESTION TWO (15 MARKS)

a) KWAL Distilleries Ltd are in possession of a particular consignment of wine, which they can either sell at the present time (*t=o)* at a sum of KES *K,* or else store for some length of time and sell at a higher value. The growing value (*V*) of the wine takes the following function of time;

$$\boldsymbol{V = Ke^{\sqrt{t}}}$$

Assuming that the interest rate on the continous-compounding basis is *r,* where the present value of *V* can be expressed as; $\boldsymbol{(A(t) = Ve^{-rt}})$.

i. Find the value of V at *t=0* **(1 mark)**

ii. What is the optimum storage time for KWAL Distillers? **(6 marks)**

iii. Assuming that *r=0.125,* then what is the number of years that KWAL Distillers will store the wine to maximize on V? **(4 Marks)**

b) Find the derivative of the following function **Y= (x+2y)^{16}** **(4 Marks)**

QUESTION THREE (15 MARKS)

a) Consider a game where, for a fixed amount of money paid in advance, you can throw a die and collect KES 1500, if an odd number shows up, or KES 2500 if the number is even.

i. By use of diagrams explain the player's possible attitudes towards risk. **(4 marks)**

ii. Calculate the expected value of the payoff **(2 Marks)**

iii. Calculate the expected utility from playing **(2 Marks)**

b) A firm has the followign total cost and demand functions;

$$\boldsymbol{C = \frac{1}{3}Q^3 - 7Q^2 + 115Q + 45}$$

$$\boldsymbol{Q = 120 - P}$$

Work out the profit maximizing level of output and the maximum profit.

(7 marks)

QUESTION FOUR (15 MARKS)

a) Given the input matrix and the final demand vector; find the solution output levels. **(8 Marks)**

$$\boldsymbol{A} = \begin{bmatrix} \mathbf{0.05} & \mathbf{0.25} & \mathbf{0.34} \\ \mathbf{0.33} & \mathbf{0.10} & \mathbf{0.12} \\ \mathbf{0.19} & \mathbf{0.38} & \mathbf{0} \end{bmatrix} \quad \boldsymbol{d} = \begin{bmatrix} \mathbf{1800} \\ \mathbf{200} \\ \mathbf{900} \end{bmatrix}$$

b) The demand curves of a price discriminating monopolist are defined by the following functions in two markets:

$$\boldsymbol{Q_1 = 17.5 - \frac{1}{4}P_1}$$

$$\boldsymbol{Q_2 = 85 - 3P_2}$$

If the monopolist's Total Cost Function is given as:

TC=70+9Q

i. Determine the selling prices and quantities of Q in the two markets. **(5marks)**

ii. What is the firm'sprofit? **(2 Marks)**

QUESTION FIVE (15 MARKS)

a) A farm faces the production function $\boldsymbol{Q = 18K^{0.4}L^{06}}$. It can buy inputs K and L for KES 600 and KES 450 respectively. The firm's output is constrained at Q=4900. Find the Least Cost Combination of K and L. **(6 Marks)**

b) Assume that the rate of investment is described by the function $\boldsymbol{I(t)} = \boldsymbol{12t^{1/3}}$ and that $K(0) = 25$:

i. Find the time path of capital stock K. **(3 marks)**

ii. Find the amount of capital accumulation during the time intervals (0,1) and (1,3) respectively. **(3 marks)**

c) Highlight any three premises of the Dormar model. **(3 Marks)**

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