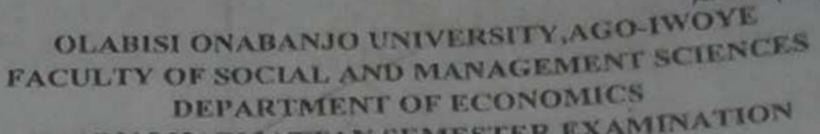
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2014/2015 HARMATTAN SEMESTER EXAMINATION

COURSE CODE/TITLE: ECO303 - MATHEMATICS FOR ECONOMISTS

INSTRUCTIONS: ANSWER ALL QUESTIONS IN SECTION A AND ANY OTHER TWO FROM SECTION B

TIME ALLOWED: 2HRS ISMINUTES

## SECTION A

i-Verify Euler's theorem for the function  $Z = x^{-3} \log \frac{y}{y}$ 

ii. Find the total derivatives,  $\frac{df}{dx}$  for  $F = \frac{6x-7y}{2x+5y}$ , where y = 3x-4

iii. Evaluate  $\int \frac{e^{3x}}{e^{3x-1}} dx$ 

Solve the following differential equations

iv.  $(4y + 8t^2)dy + (16yt - 3)dt = 0$  (12y<sup>2</sup>t<sup>3</sup> + 10y)dy +  $(8y^3t)dt = 0$ Specify the order and the degree of the following differential equations

vi.  $\left(\frac{d^2y}{dx^2}\right)^3 + \frac{d^4y}{dx^2} - 75 = 0$  vii.  $\left(\frac{d^3y}{dx^3}\right)^6 + \frac{d^3y}{dx^3} = 4 - y$ 

viii. Solve for the values of x and y in the matrix equation  $\frac{5}{7}(x) = \frac{15}{y}$ 

ix: Given that  $\frac{dy}{dt} + 4y = 12$ , find y(t) and establish the dynamic stability of y(t)

At Use a general solution to solve this equation, at + 4yt = 6t.

## SECTION B

P = Q<sup>2</sup> - 2Q<sub>1</sub> + 12. Calculate the (i) Consumer's Surplus (ii) Producer's Surplus

(b). Find the demand function Q = RP), if own principal planticity of demand, t = 3p'+ 2p and -Q = 500, when p = 10

(c) The marginal revenue function of a myspotelistic producer is MR - 10 - 4Q. Find (i) the total revenue function and (ii) the corresponding demand equation

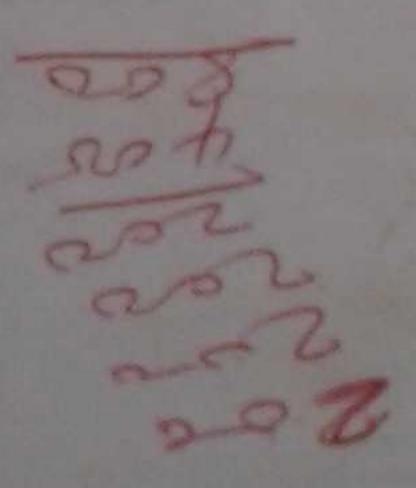
(a) Maximise the production function of a given firm: Q = ALa Ka subject to a cost outlay C = w/ + rk where, / = labour = capital, A = efficiency parameter, a, B= input share parameters, w and r are the poop of labour and capital.

(b) A monopolistic producer of two goods G1 and G2 has a total function TC = 5Q1 + 10Q2, 10 see Q1 and Q2 are quantities; G1 and G2 respectively. If P1 and P2 are the corresponding prices, then the demand equations are

 $P_1 = 50 - Q_1 - Q_2$ 

P = 100 - Q - 4 Q

Find the maximum profit, if the firms total costs are fixed at 100



- 4(a) Minimise a firm's total cost  $C = 45K^2 + 90KL + 90L^2$  when the firm has to meet the production quota equal to 2K + 2L = 60, by finding the quantity of capital and labour, using the Bordered Hessian Matrix, test if the cost is really minimised.
- (b) Use Langrangiers multipliers method to find expressions for  $x_1$  and  $x_2$ , which maximise the utility function  $U = x_1^{1/2} + x_2^{1/2}$  subject to the general budgetary constraint  $P_1X_1 + P_2X_2 = M$
- 5(a) The demand function for a commodity takes the form Qd = a + bp + c/p for some constants a,b,c. When p=1, the quantity demanded is 60, when p=2, it is 40, and when p=4 it is 15. Use the technique of Gaussian elimination or matrix reduction to find the value for the constants a, b, and c.

Solve the system of equations  $4x_1 + x_2 + 3x_3 = 8$   $-2x_1 + 5x_2 + x_3 = 4$   $3x_1 + 2x_2 + 4x_3 = 9$ Using Cramer's rule, find  $x_1$ ,  $x_2$  and  $x_3$ 

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