OLABISI ONABANJO UNIVERSITY, AGO- IWOYE
FACULTY OF SOCIAL SCIENCES
DEPARTMENT OF ECONOMICS
2016/2017 Harmattan Semester Examination

Course Code: ECO303
Course Title: Mathematics for Economist II
Instructions: Attempt any TWO questions from **EACH OF THE SECTIONS IN SEPARATE ANSWERS BOOKLETS**
Time Allowed: 2Hrs:30Mins

SECTION A: (Time Allowed 1HR:15Mins)

Question 1

The total cost of producing q unit of a certain product is described by the function C=200000+3000q+0.4q^2 and the demand function for q unit is given as 400p = 200000 – q.

Required:

(a) Determine the number of units of q that should be produced in order to minimize average cost per unit.
(b) Use the relevant function(s) from the above to show that MC=AC at the minimum point of AC.
(c) Using the functions above, determine the units of output that should be produced to maximize profit and its maximum profit obtainable.
(d) Suppose per unit tax of 20 is imposed, what is the new profit?. Compare your result with (c) and state the implication of the tax imposed.

Question 2

(a) OOU Ventures is producing two goods X and Y. The profit function ∏ of OOU Venture is given as ∏= 128x -4x^2 +8xy - 8y^2 + 64y -28. Find: (i) the profit maximising level of output for each of the two commodities produced by OOU using cramer's rule. (ii) show that profit is actually maximized.
(b) SAB and KAYMARKS Nigeria Ltd put up a bonanza sales and parcelled together in a set types of their tentile materials X,Y and Z. The first tentile contains 3 bundles of type X, 4 bundles of type Y and 2 bundles of types Z were sold for #38000. The second set contains 5 bundles of type X, and 6 bundles of type Y which was sold for #41000, while the third set containing 2 bundles of type X, 3 bundles of Y and a bundle of type Z was sold for #24000. Represent the above information as a system of equation and use any method of your choice to determine the selling price of each of tentile materials.

Question 3

(a) A market contains firm A and firm B whose their price policies are different. The price of firm A is $P_A = Q_A + 800$ and the price of firm B is $P_B = 800 - 4Q_B$; and the market has limited quantity of 50units to be sold at a particular point in time, noting that the firms are constrained to equal units. Given that the cost of production in the market is TC = 1200 + 100Q, find (i) revenue functions of A and B; (ii) the output of each firm that maximizes profit level; (iii) the prices of the two firms.

(b) Solve the following system of equation

$$x_1 + x_2 + x_3 = 6$$
$$2x_1 - 3x_2 - 12x_3 = 5$$
$$x_1 - x_2 - 5x_3 - 3 = 0$$

Question 4

(a) Show whether or not the function Z= x^3-3xy^2 satisfies the Laplace theorem.
(b) Explain Euler's theorem using relevant examples and it economic implication
(c) Verify $f_{xy}=f_{yx}$ when $f(x,y) = 2x^3 + 2y^3 - 6xy$

(d) Find the relative extrema of the function $y = x^3 - 3x^2 + 2$ and determine the nature of those points.
(e) With illustration distinguished between the Jacobian and the Hessian determinant of matrix.
(f) Find the first, second partials of the function, if $q = 4K^{0.4}L^{0.6}$ and the degree of homogeneity of this function

SECTION B: (Time Allowed 1HR:15Mins)

Question 1

(a) Given the total cost function as $C = q^3 - 90q^2 + 550$ and the price function as $P = 110 - 5q$. Determine
(i) The output level that maximise profit
(ii) The out level that maximizes the net earnings
(b) Given $(5yt^2)dy + (5y^2t + 8t^2)dt = 0$.
(i) Determine whether the differential equation is exact or not
(ii) Solve for F(t,y)

Question 2

(a) Use the general equation to solve the differential equation: $\frac{dy}{dt} - 4yt = 6t$, hence establish the dynamic stability or otherwise of the ordinary differential equation
(b) Determine the integrating factor in each of the following:
(i) $t^2dy + (3yt)dt = 0$
(ii) $(7y + 4t^2)dy + (4ty)dt = 0$

Question 3

(a) Given the own price elasticity of demand $\epsilon = (6p + \frac{1}{2}p^2/q)$. Find the demand function provided q = 250, when p=5
(b) Given the investment function as $I(t) = 8(\sqrt[3]{t})$
(i) Derive the investment path equation
(ii) The capital formation between the beginning of the first year and the end of the eighth year
(iii) Period of time (t) it takes the investment to yield returns above #3000.

Question 4

(a) Evaluate (i) $\int \frac{2x^3+1}{3x^4+2x}dx$ (ii) $\int x^2e^{x^3+3}\,dx$ (iii) $\int_1^2 (2-4x)^9dx$
(b) Specify the order and the degree of the following differential equations
(i) $\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2}(x^2y) - 4y^3 = 0$
(ii) $(\frac{d^3y}{dx^3})^4 + (\frac{d^4y}{dx^4})^2 - 75y = 0$
(iii) $y^{III} + (y^{II})^3 - 4 = y$
(iv) $\frac{d^2y}{dx^2} + (\frac{dy}{dx})^3 = 12x$