OLABISI ONABANJO UNIVERSITY AGO- IWOYE
HARMATTAN MID-SEMESTER TEST 2016/2017 SESSION

COURSE TITLE: Mathematics for Economists II (3 UNITS)
COURSE CODE: ECO 303 **TIME ALLOWED: 60 Minutes**
INSTRUCTION: ATTEMPT ALL QUESTIONS

1. (a) If $Q = 8x - 0.0001x^2 + 0.05xy - 77.5y^2 - 10{,}000$; where Q = output, X = packets of shirts, Y = number of shirts in each packet. How many shirts each packet contains? How many shirts should be sold?

   (b) Differentiate the followings with respect to x (i) $f(x) = x^2 e^{x^2+3x}$ (ii) $y = \log_e(x^4 - 2x^3 + 7)$ (iii) $f(x) = \dfrac{3}{\sqrt[3]{x^2 - 2}}$

2. Given a demand function where: $Q = 200 - 2P_1 - P_2 + 0.1y^2$; where $P_1 = 10$, $P_2 = 15$ and $y = 100$. Find:

   a. (i) The price elasticity of demand
      (ii) Cross price elasticity of demand
      (iii) Income elasticity of demand

   b. What are the natures of price and cross-price elasticities of demand and the goods?

3. (a) A manufacturing firm has its marginal cost function given as $C = 0.8q^2 + 4q + 10$. if the firm's average revenue function is $P = 3 - \frac{3}{8q}$, calculate (i) Total revenue function, (ii) Profit function (iii) profit maximizing output and price at maximum output level.

   (b) Integrate the following function by part: (i) $\int (x\sqrt{2x - x})dx$ (ii) $\int (x+2)(x-1)^4 dx$

4. (a) If $y^{IIII}(t) = 5t^2$, find y(t). (b) Use the general equation of the first order linear differential equation to solve each of the following:

   (i) $\dfrac{\partial y}{\partial t} - 6y = \dfrac{18}{2}$

   (ii) $\dfrac{\partial y}{\partial t} + 4t = -20$

   (iii) $\dfrac{\partial y}{\partial t} + 3t^2 = t^2$

   (c) Test for the dynamic stability in (b) above.

5. Given a utility function of a consumer as $U = X \ln Y$ and his budget constraint is $2X + 3Y = 100$. (i) State his composite function (ii) the units of X and Y that will be consumed to satisfy Hessian condition (iii) Using Bordered Hessian, find the optimum units of X and Y.