BANKURA UNIVERSITY

Semester: I Examination, 2020-21

Subject Name: ECONOMICS Course ID: 1 1 6 1 2

Course Code: UG/ECO/102/C-2 Group ……..

Course Title: Mathematical Methods in Economics-I

Full Marks: 40 Time allowed: 2Hours

The figure in the right hand side margin indicate marks

The questions are of equal value

1. Answer any five of the following questions: **2 x 5 = 10**

a) Explain the concept of universal set with a suitable example.

b) Using the formula of the sum of n terms of an A.P. series, find the sum of the first *n* natural numbers.

c) Write the equation $y = ax^b$ in terms of logarithms.

d) For two matrices A and B, find A - B, when, $A = \begin{bmatrix} 5 & 6 \\ 9 & 0 \end{bmatrix}$ *and* $B = \begin{bmatrix} 3 & 4 \\ 9 & 3 \end{bmatrix}$

e) Draw an upward rising curve with diminishing slope and give an example of such a curve from economic theory.

f) In a market, the demand and supply functions are given as follows:

$$D = 30 - 3P$$
$$S = 15 + 2P$$

Find out the equilibrium price.

g) A Saving Function is given by: $S = 0.25Y - 1500$, find out the *Consumption Function* and the *Marginal Propensity to Consume (MPC).*

h) State the Product Exhaustion Theorem for a homogenous production.

2. Answer any four of the following questions: **5 x 4 = 20**

a) Define a Homogenous Function. What are the different types of Returns to Scale? Find the Degree of Homogeneity and Return to Scale of the following production function:

$$Q = k^2 + kl + l^2$$

b) Find out the Average & Marginal Cost Functions from the Total Cost Function:

$$Q = 35 + 5Q - 2Q^2 + 2Q^3$$

Evaluate the marginal cost (MC) at Q = 3 and the average cost (AC) at 5

c) Find the Price Elasticity of Demand at P = 20 for the demand function:

$$Q = 1400 - P^2$$

d) Find out the Elasticity of Factor Substitution for a Cobb-Douglas Production Function.

e) Find out the Inverse of the matrix:

$$A = \begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix}$$

f) Apply Cramer's Rule to solve for equilibrium national income Y and the corresponding aggregate consumption C for the national income model,

$$Y = C + I_0 + G_0$$
$$C = a + bY, (where\ a \geq 0\ and\ 0 \leq b \leq 1)$$

$I_0\ and\ G_0$ represent autonomous investment and autonomous govt. expenditure respectively.

g) Given, $q = 700 - 2p + 0.02y$, where q, p and y represent quantity demanded, price and income of the consumer respectively. Find the income elasticity of demand at p = 25 and y = 5000.

3. Answer any one of the following questions: **1 x 10 = 10**

a) The utility function of a consumer for two goods x and y is given by

$$U = f(x,y) = (x+2)(y+1) and\ the\ budget\ constraint\ is\ 4x + 6y = 130$$

Find the optimum values of purchase of the two commodities x and y. verify the second order condition for maximum utility with the help of Bordered Hessian Determinant.

b) Define Consumer Surplus and Producer Surplus. In a perfectly competitive market, the demand and supply curves are given by $P_d = 10 - q\ and\ p_s = q + 2$. Find consumer surplus and producer surplus at equilibrium price.