



'সমানো মন্ত্র: সমিতি: সমানী'

**UNIVERSITY OF NORTH BENGAL**

B.A./B.Sc. Honours 1st Semester Examination, 2022

**CC2-ECONOMICS (102)**

**MATHEMATICAL METHODS FOR ECONOMICS-I**

Time Allotted: 2 Hours

Full Marks: 60

*The figures in the margin indicate full marks.*

**GROUP-A**

1. Answer any **four** questions: 3×4 = 12
- (a) Given the supply function,  $x = 2\sqrt{P-7}$ , examine how the elasticity of supply ( $\pi_s$ ) changes with price. 3
- (b) What do you mean by Inverse of a Matrix? 3
- (c) Prove that  $MR = AR\left(1 - \frac{1}{\epsilon_d}\right)$  where  $MR$  is marginal revenue,  $AR$  is average revenue and  $\epsilon_d$  is price elasticity of demand. 3
- (d) For any total cost function,  $10Q + 2Q^2 - Q^3$ . Show that at minimum point of  $AC$ ,  $AC = MC$ . 3
- (e) What do you mean by point of inflexion? 3
- (f) What do you mean by closed and open Input-output model? 3

**GROUP-B**

**Answer any four questions**

**6×4 = 24**

2. The marginal cost of production is found to be  $MC = 2000 - 40x + 3x^2$ , where  $x$  is the number of units produced. The fixed cost of production is Rs. 18,000. Find the total cost and the average cost functions. 6
3. Verify Euler's theorem for the production function  $q = 75[0.3K^{-0.4} + 0.7L^{-0.4}]^{-2.5}$  6
4. State Hawkins-Simon conditions for the viability of input-output system. 6

5. The production function of a firm is given by  $q = -3L^3 + 18L^2 + L$ . 6  
 Find the point of inflexion for this function and show that when  $AP$  is maximum it is equal to  $MP$ .
6. For any utility function  $U = K^{0.6}L^{0.4}$  and Budget equation  $5K + 10L = 1000$ , find out first order equilibrium condition. 6
7. Suppose the Revenue function for a product  $R = 32Q - 2Q^2$  and cost of production is given by  $C(Q) = 2Q^2$ , find the following 6  
 (a) Profit function  
 (b) Derivation of 1st and 2nd order condition of profit maximization  
 (c) The price and quantity that maximizes profit.

**GROUP-C**

**Answer any two questions**

12×2 = 24

8. Given the following input coefficient 12  
 Matrix-  $A \begin{bmatrix} 0.2 & 0.3 & 0.2 \\ 0.4 & 0.1 & 0.2 \\ 0.1 & 0.3 & 0.2 \end{bmatrix}$  and  
 the output vector  $X \begin{bmatrix} 25 \\ 21 \\ 18 \end{bmatrix}$ , find the demand vector  $D$ .
9. Derive the compensated demand function of  $q_1$  and  $q_2$  for the utility function  $U = q_1q_2$  and budget constraint  $p_1q_1 + p_2q_2 = M$ , where  $p_1$  and  $p_2$  are prices of  $q_1$  and  $q_2$  respectively. 12
10. The total cost function is given by  $C = 5000 + 1000q - 500q^2 + \frac{2}{3}q^3$  2+2+2+6  
 (i) Find the  $MC$  equation  
 (ii) Find the expression for the slope of  $MC$  function  
 (iii) Find the average cost function  
 (iv) At what value of  $q$  does  $MC$  equal  $AC$ .
11. Maximize the utility function  $U = x^\alpha y^\beta$  if  $P_x P_y$  are the prices of two goods  $x$  and  $y$ , given the individual's fixed income is  $\mu$  4+4+4  
 (a) Also find the demand function for  $x$  and  $y$ .  
 (b) Show elasticity of demand for  $x$  is equal to unity.

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