



'সমানো মন্ত্র: সমিতি: সমানী'

UNIVERSITY OF NORTH BENGAL

B.A./B.Sc. Honours 1st Semester Examination, 2021

CC2-ECONOMICS

MATHEMATICAL METHODS FOR ECONOMICS-I

Time Allotted: 2 Hours

Full Marks: 60

*The figures in the margin indicate full marks.
All symbols are of usual significance.*

GROUP-A

1. Answer any **four** questions from the following: 3×4 = 12
 - (a) Given the total cost function $C = 4Q - Q^2 + 2Q^3$, show that $AC = MC$ when AC is minimum. 3
 - (b) State the important assumptions of input-output analysis. 3
 - (c) Show that CES production function follows CRS. 3
 - (d) What do you mean by indirect utility functions? 3
 - (e) Explain point of inflexion with a suitable graph. 3
 - (f) Find out the determinants of the following matrix. 3

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

GROUP-B

Answer any four questions from the following 6×4 = 24

2. A production function is given by $Q = 7K^{0.5}L^{0.3}$. If the prices of K and L are Rs. 2 and Rs. 3 respectively, obtain the equation of expansion path. 6
3. Suppose the demand function of a commodity 'X' is given by $Q_X = 25 - 2P_X + P_Y$, where P_X and P_Y are prices of X and Y respectively. Find the own price elasticity of demand and cross price elasticity of demand for 'X'. 3+3
4. Find the elasticity of substitution for the production function 6

$$Q = 75(0.3K^{-0.4} + 0.7L^{-0.4})^{-2.5}$$

5. The demand and supply functions of a commodity are given by $q = \frac{20-p}{3}$ and $q = \frac{p}{2}$ respectively. 6

Find the consumer surplus when the commodity is a free good.

6. The marginal cost (MC) of a firm is given by $MC = 1.052 - 0.004q$. If the fixed cost of the firm is given by $FC = 16.8$, obtain the total cost function of the firm. 6

7. Derive any two properties of Cobb-Douglas production function. 3+3

GROUP-C

Answer any two questions from the following

12×2 = 24

8. Find the demand vector D consistent with the output vector. 7+5

$$X = \begin{bmatrix} 25 \\ 21 \\ 18 \end{bmatrix} \text{ and the coefficient matrix } A = \begin{bmatrix} 0.2 & 0.3 & 0.2 \\ 0.4 & 0.1 & 0.2 \\ 0.1 & 0.3 & 0.2 \end{bmatrix}$$

Test whether the Hawkins-Simon conditions for the viability of the systems are satisfied.

9. Consider a CES type production function 12

$$Q = A [\alpha K^{-\rho} + (1-\alpha)L^{1-\rho}]^{-\frac{1}{\rho}}$$

Prove that it will converge to Cobb-Douglas production function if $\rho \rightarrow 0$.

10. Derive Slutsky equation in a two commodity framework. 12

- 11.(a) The production function for a commodity is 5+7

$$Q = 10L - 0.1L^2 + 15K - 0.2K^2 + 2KL.$$

Calculate the marginal products of the two inputs.

- (b) Given the production function $Q = K^{\frac{1}{2}}L^{\frac{1}{2}}$ and $P_K = \text{Rs. } 4$, $P_L = \text{Rs. } 8$ and $C = \text{Rs. } 400$. Determine the maximum level of output subject to the cost constraint.

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