

INDIAN STATISTICAL INSTITUTE
End-Semester Examination 2025-26
B. Stat. II: 2025-26

Subject: Microeconomics

Date: 27/11/2025

Maximum marks: 50

Time: 3 hours

Answer any FIVE questions.

1. Let the production function of a price-taking firm be $f(x_1, x_2)$, where x_1 and x_2 are the amounts of two inputs; $x_1, x_2 \geq 0$. The prices of the two inputs are w_1 and w_2 , respectively ($w_1, w_2 > 0$), and the price of the product is assumed to be $p = 1$. How do you solve for the optimal input demands and profit of the firm? Now suppose that w_1 goes up. Find its effect on the optimal input demands for x_1 and x_2 and on the profit level. [10]
2. Suppose the long-run cost function of each firm in a competitive industry is $C(q) = q^3 - 4q^2 + 8q$, where $q \geq 0$ is the output produced by a firm. Firms enter the industry if profits are positive and leave the industry if profits are negative. Describe the industry's long-run supply function. Assume that the industry demand function is $D(p) = 2000 - 100p$ where p is the product price. Determine the price of the product and the number of firms in the industry in equilibrium. [10]
3. Consider a pure exchange economy with two price-taking consumers, A and B, and two goods, X^1 and X^2 . Their utility functions are respectively $U_A(x_A^1, x_A^2) = (x_A^1)^\alpha (x_A^2)^{1-\alpha}$ and $U_B(x_B^1, x_B^2) = (x_B^1)^\beta (x_B^2)^{1-\beta}$; $0 < \alpha < 1$, $0 < \beta < 1$. Consumers A and B own an endowment vector of goods given by $e_A = (10, 0)$ and $e_B = (0, 10)$, respectively. How do you solve for the prices of the goods and consumption vector in (general) equilibrium? [10]
4. (a) A monopolist faces the following market demand function in which quantity demanded (Q) depends not only on the market price (P) the firm charges, but also on the amount of advertising (A) the firm does: $Q = (20 - P)(1 + 0.1A - 0.01A^2)$. Its cost function is given by: $C(Q) = 10Q + 15 + A$. The monopolist optimally chooses both the price of the product and the level of advertisement to maximize its profit. Determine its price and advertisement in equilibrium. [6]
(b) Suppose a monopolist has taken an order to supply an output level Q at a specified price. It has two plants of production, which correspond to the following cost functions: $C_1(Q_1) = Q_1^2/2$ and $C_2(Q_2) = Q_2$; $Q_1, Q_2 \geq 0$. Decide how much quantity it will produce in these two plants. [4]

5. (a) A monopolist is facing the following demand function: $D(p) = \begin{cases} \frac{10}{p} & \text{if } p \leq 20 \\ 0 & \text{if } p > 20 \end{cases}$. and its marginal cost of production is 2. Derive its profit-maximizing price and quantity, and explain your result. [5]
- (b) Consider the market for a particular good. There are two types of customers: the low-demand customers have the demand function $p = 10 - q$, and the high-demand customers have the demand function $p = 2(10 - q)$. A monopolist which serves these two markets, has the cost function $C(q) = 4q$. However, it is assumed, the monopolist is unable to price discriminate, that is, it is forced to charge a uniform price for all the units to all its customers. Find the price it will charge and the total quantity it will produce. [5]
6. (a) Consider a firm which has a cost function $C(q) = F + mq$; F and m are positive constants, and q is the quantity produced. Suppose the firm is a price taker and it wants to maximize profit. However, it has a maximum production capacity $\bar{q} > 0$, that is, it cannot produce more than $\bar{q}$. Derive the supply curve of this firm. [5]
- (b) Formally derive the cost function of a firm which has a production function $q(L, K) = \alpha L + \beta K$; $(\alpha, \beta) > 0$, where $L, K \geq 0$ are the inputs used and q is the output produced. [5]
7. Consider the following Cobb-Douglas production function $f(k, l) = Ak^a l^b$; $(A, a, b) > 0$.
- Give an economic interpretation of the parameters A , a , and b . [2]
 - Derive the expression of the elasticity of substitution (σ) for this function. [3]
 - Derive the equation of the expansion path for this function. Explain its nature. [3+2]
8. (a) What do you mean by the minimum support price (MSP) policy? Show, in terms of market demand and market supply, how it works. [5]
- (b) Write a brief note on the MSP in Indian agriculture. [5]