

INDIAN STATISTICAL INSTITUTE
MID-SEMESTER EXAMINATION: 2025-26
B. STAT. II: 2025-26
Microeconomics

Date: 12/09/2025

Maximum Marks: 30

Duration: 3 Hours

Answer any THREE questions.

Each question carries 12 marks, but your total score will NOT exceed 30.

1. (i) Define Marginal Rate of (Commodity) Substitution (MRS) in the theory of consumers' behavior. (ii) What is the implication of diminishing MRS? (iii) Given the utility function $U(x, y)$, derive the condition for diminishing MRS. (iv) Derive the expression of MRS for the utility function $U(x, y) = A[ax^{-\rho} + (1-a)y^{-\rho}]^{-\frac{1}{\rho}}$; $A > 0, 0 < a < 1, \rho > -1, \rho \neq 0$.

[2+2+4+4 = 12]

2. (a) Let the utility function of a consumer be $U(x, y) = x^{0.5} + y^{0.5}$. Prices of the two goods are p_x and p_y , and money income of the consumer is m ; $(p_x, p_y, m) > 0$. (i) Find the utility maximizing purchase of the consumer. (ii) How will the share of income spent on good X be affected if p_x goes up? Try to explain the effect.

(b) A consumer has utility function $U(x_1, x_2) = 20 \log x_1 + 2x_2$. The prices of two goods are $(p_1, p_2) = (5, 10)$.

(i) Find the optimal purchase of these two goods if the income of the consumer is $m = 80$.

(ii) Find again the same if the income of the consumer be $m = 120$.

[(3+3) + (3+3) = 12]

3. (i) Given the utility function $U(x, y)$ of a consumer, define Price Effect, Income Effect and Substitution Effect. (ii) Show in terms of a diagram that Price Effect = Substitution Effect + Income Effect. (iii) Will the price effect be always negative? If not, show the other possibilities with the help of diagrams.

[3+4+5 = 12]

4. (a) Let the market demand and supply of a product be given by $D(p) = 20 - p$ and $S(p) = p$ respectively. (i) Find the equilibrium price and quantity of the product. (ii) Now if the government imposes a tax $t = 5$ per unit on the product, what will be the buyers' price and

sellers' price in this case? (iii) If the government would want to maximize its tax revenue, what tax rate would it charge per unit?

(b) Given any downward sloping demand function and upward sloping supply function, show how the incidence of (per unit) tax (i.e., the burden of tax on buyers and sellers) depends on the price elasticity of demand and supply.

$$[(2+3+3) \div 4 = 12]$$

5. The demand for a product in Indian market is given by the function $D(P) = 90 - P$. Its supply comes from both home firms and foreign firms. The home supply curve is $S_h = P$. The foreign supply (S_f) curve is exactly the same as the home supply curve.

(a) Find the aggregate supply curve and the equilibrium market price of the product.

(b) Now suppose that the domestic industry lobbies for protection, and as a result the local government agrees to put a tariff of Rs 3 per unit on foreign products.

(i) What will be the price to be paid by the consumers in the new situation?

(ii) Find the corresponding supply of goods by the domestic firms and by the foreign firms.

(iii) Draw a diagram to show your results.

$$[3 + (5 + 2 + 2) \div 12]$$

6. (a) Make clear the concept of stable (market) equilibrium. State and derive each of Walrasian and Marshallian static stability conditions for equilibrium.

(b) Consider the following market model: $D_t = a - bP_t$, $S_t = \alpha - \beta P_t$, and $P_t = P_{t-1} + k(D_{t-1} - S_{t-1})$ where D_t , S_t , and P_t denote respectively the amount of demand, the amount of supply, and the price of the product at time t ; a , b , α , β , and k , all are positive real numbers.

Derive the time path of price and examine whether the price is stable in the dynamic sense.

$$[6 + 6 = 12]$$