SX/S-2/UG(A) —
Eco (IV)

2017

Time : 3 hours

Full Marks : 70

Candidates are required to give their answers in their own words as far as practicable.

The questions are of equal value.

*Answer any **five** questions.*

1. Suppose that the three markets in an economy are related by the price x_1, x_2, x_3. Also suppose that the relationship among these prices are given by $- 2x_1 + 2x_2 + 2x_3 - 25 = 0$ and $2x_1 - 2x_2 + 2x_3 - 25 = 0$ and $2x_1 + 2x_2 - 2x_3 - 25 = 0$ Find the prices in rupees that solve the system using inverse.

2. Given the following production function :
    $Q = L^{4/5} K^{1/5}$, where Q is output, L is labour and K is capital.

    (a) Find the marginal product of labour.

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(b) Find the marginal product of capital.

(c) Show that, if factors are paid their marginal product, the wage bill is four times the capital rental bill.

(d) Show that the total factor payments equal the value of output.

3. Let the demand function for milk be given by $Q = 205Y^{1.3}P^{-1.6}R^{0.7}$, where Q is the quantity of milk demanded, P is the mean retail price of the milk and R is the mean retail price of all other commodities. Calculate :

(a) The price elasticity of demand

(b) The income elasticity of demand

(c) The cross price elasticity of demand

4. Suppose that the total cost (C), in rupees, of producing two goods by a multiproduct firm is given by $C = f(q_1, q_2) = 100 + 3q_1^2 + 2q_2^2 - 2q_1q_2 - 4q_1 - 4q_2$, where q_1 and q_2 represent the quantities of good 1 and good 2, respectively.

How many units of the two goods must the firm produce in order to minimize the total cost ? What will be minimum cost of the firm ?

5. Assume that the output Q produced by a firm using K units of capital and L units of labour is given by the Cobb-Douglas production function $Q = F(K, L) = K^{\alpha}L^{1-\alpha}$. Also assume that the firm's buget constraint is given by $r.K + w.L = C$, where r, w and C denote interest rate, wage rate and available fund in rupees respectively.

(a) Find the quantities of K and L that the firm must use to maximize its output assuming $a = 0.5$, $r = 0.1$ (or 10 percent), $w = ₹ 10$ and $C = ₹ 100$.

(b) Find the elasticity of substitution between the two factors.

6. Consider the market model :

$$Q_s = 3P - 4, \quad Q_d = -5P + 20 \text{ and } \frac{dP}{dt} = 0.2(Q_d - Q_s)$$

Find expressions for P(t), $Q_s(t)$ and $Q_d(t)$ when $P(0) = 2$. Is this system stable or unstable ?

7. Solve the following :

(a) State and prove Envelope Theorem for unconstrained optima.

(b) The height of the ball is given by $f(t) = -0.05gt^2 + 40t$. Find t which maximizes height. Now if g = 32 the maximum height is 25 and if g = 32.1 then the height becomes approx 24.92 which shows a fall of approx 0.08. Verify this result and show that how envelope theorem can be used to derive the same result.

8. Answer any **two** of the following :

(a) Properties of **vector addition** and properties of **scalar multiplication**.

(b) Assume that two combinations of two goods (x and y) purchased by a consumer are given by the two row 2-vectors $u' = [x_1\ y_1]$ and $v' = [x_2\ y_2]$ and the price of the two goods are given by the row 2-vector $p' = [p_x\ p_y]$. The consumer's income is given by I. Show the consumer's budget line and commodity space. Also show that the price vector is orthogonal to budget line.

(c) A principal of ₹ 4,000 is invested at an annual interest rate of 6% and the future value of this investment t years later is S(t), which satisfies $\dfrac{dS}{dt} = 0.06S$. Solve this equation to express S in term of t. What type of compounding is represented by this model ?

(d) Properties of a homogeneous production function.

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