37 (Sem–2) ECO 2.3

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ECONOMICS

Paper : 2.3

(Mathematical Methods—II)

Full Marks : 80

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

1. Answer the following questions :   2×4=8

   (a) Explain the term 'pay-off matrix' of game theory.

   (b) Solve the difference equation given by $y_t = -0 \cdot 1 y_t$.

   (c) For the utility function $U = (x^2 + y^2)$, find the marginal utility of x and y at $x = 1$ and $y = 2$.

   (d) State the conditions for considering a system of equations to be called linear programming.

2. Answer any *three* from the following questions : 8×3=24

(a) Taking an imaginary pay-off matrix, explain how the saddle point is obtained in a two-person zero-sum game.

(b) If the demand function of a monopolist is $q = 400 - 20p$ and the average cost is $5 + q/50$, where q is output and p is price, find the maximum profit of the monopolist.

(c) Taking three commodities and five nutritional requirements, explain the formulation of diet problem of linear programming.

(d) Find x and y that maximizes the utility function $U = x^2 y^3$, subject to the budget constraint $x + 4y = 10$.

(e) Explain the concept of Nash equilibrium.

3. Answer any *three* from the following questions : 16×3=48

(a) Explain various rules of dominance of game theory.

A and B play a game in which each has three coins, a 5 paise, a 10 paise and a 20 paise. Each selects a coin without the knowledge of the other's choice. If the sum of the coins is an odd amount, A wins B's coin, if the sum is even, B wins A's coin. Find the value of the game and the probabilities of choosing the strategies. 6+10=16

(b) Explain Harrod-Domar model of growth when *(i)* the autonomous investment is fixed and when *(ii)* the autonomous investment is progressive. 6+10=16

(c) If $u = x^\alpha y^\beta$ is any individual's utility for two goods, show that his demand for goods is

$$x = \alpha u /(\alpha + \beta)p_x \text{ and } y = \beta u /(\alpha + \beta)p_y \quad 16$$

(d) A product Y is produced with two factors A and B according to the production function

$$Y = 3a^{3/8}b^{5/8}$$

If $p_a = 4$ and $p_b = 3$, find the optimum usage of factors which will produce an output 300, at minimum cost. 16

(e) If the demand and supply models are given by

$$X_d = \alpha + \beta p_t \text{ and } X_s = \gamma + \delta p_{t-1}$$

where α, β, γ and δ are positive constants and initial price is p_0, find the time path of price and discuss its nature.   16

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