

QP Code : 23/PT/11/IV

POST-GRADUATE COURSE
Term End Examination — June, 2023/December, 2023
ECONOMICS

Paper-IV : MATHEMATICS FOR ECONOMICS

Time : 2 hours]

[Full Marks : 50

Weightage of Marks : 80%

Special credit will be given for precise and correct answer. Marks will be deducted for spelling mistakes, untidiness and illegible handwriting. The figures in the margin indicate full marks.

Use of scientific calculator is strictly prohibited.

1. Answer any *four* of the following questions : $2\frac{1}{2} \times 4 = 10$

- a) What is a homogeneous function ?
- b) Calculate price elasticity of demand if the demand function is $q = \frac{60}{p^2}$.
- c) Determine the degree of homogeneity of the CES production function.
- d) Define mathematically the concept of consumer's surplus.
- e) What is a square matrix ?
- f) Give the general form of a linear homogeneous difference equation.

2. Answer any *four* of the following questions : $5 \times 4 = 20$

- a) Briefly mention some major types of functions.
- b) Let the production function $q = F(K, L)$ be homogeneous of degree one. Prove that marginal productivities of K and L will depend only on input ratio. $2\frac{1}{2} \times 2$
- c) Show that under Cobb-Douglas production function, the expansion path is a straight line through the origin, provided input prices are fixed.
- d) $MR = 15 - 2q - q^2$. Find maximum TR.

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- e) If the absolute value of price elasticity of demand is β , then deduce the demand function.
- f) Given the inverse supply function, $p = 30 + 2q$, determine producer's surplus at $p = 50$.

3. Answer any *two* of the following questions : 10 × 2 = 20

- a) Show that under Cobb-Douglas production function obeying constant returns to scale, AP_K , AP_L , MP_K and MP_L will be diminishing.

$2\frac{1}{2} \times 4$

- b) Prove that under CES production function, iso-quants will be downward sloping and convex to the origin. 5 × 2

- c) Equations in commodity and money markets, respectively, are

$$100r + 0.375Y = 240$$

$$200r - 0.25Y = -130$$

Determine the equilibrium rate of interest (r) and the equilibrium level of income (Y) by using either Cramer's rule method *or* matrix inversion method.

- d) We have the following equations of a simple Keynesian model :

$$C_t = a + bY_{t-1}, \quad 0 < b < 1, \quad a > 0$$

$$I_t = A, \quad (A > 0)$$

$$Y_t = C_t + I_t \quad (\text{Equilibrium condition})$$

Determine the time path of income (Y).

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