

POST-GRADUATE COURSE

Term End Examination — June, 2022/December, 2022

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) i) What is constant function ?
ii) Give the definition of polynomial function.
- b) State the relation among AR, MR and price elasticity of demand.
- c) Let $U = f(q_1, q_2)$, deduct the slope of an indifference curve.
- d) Evaluate $\int_1^3 7x^2 dx$.
- e) Define matrix. What do you mean by Idempotent matrix ?
- f) Solve $Y_t = 2Y_{t-1} + 3$.
2. Answer any *four* of the following questions : $5 \times 4 = 20$
- a) i) What do you mean by linear homogeneous difference equation ? 2
ii) Given $Y_{t+1} = \alpha Y_t - \beta$. Find the time path of Y. 3
- b) Given $MC = 25 + 30q - 9q^2$; $TFC = 100$. Find TC, TVC, AC and AVC.

- c) If $A = \begin{bmatrix} 2 & -3 \\ 4 & -11 \end{bmatrix}$, find A^{-1} .
- d) The demand function is $D = 74 - 2p - p^2$. Calculate price elasticity of demand when $D = 50$.
- e) Determine the degree of homogeneity in the following two cases :
- i) $z = \frac{x}{y}$
- ii) $y = 30x_1^\alpha x_2^\beta$
- f) Let $C = x^3 - 6x^2 + 15x$ be the TC function. Show that when AC is minimum, $AC = MC$.

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

- a) Given $P = 1200 - 2q$ and $C = q^3 - 61.25q^2 + 1528.5q + 2000$. Determine profit maximising p and q and also maximum profit.
- b) i) Given the demand function : $D = 4 - x^2$ and the supply function. $S = x + 2$, find consumer's surplus and producer's surplus assuming perfect competition.
- ii) Demand function : $D = \frac{25}{4} - \frac{P}{8}$ while the supply function is $P = 5 + D$. Determine consumer's surplus and producer's surplus at equilibrium price.
- c) An economy uses coal and steel to produce coal and steel. Suppose, 0.4 tonne of steel and 0.7 tonne of coal are required to produce 1 tonne of steel. Similarly, 0.1 tonne of steel and 0.6 tonne of coal are required to produce 1 tonne of coal. Is the system viable ? Again, 2 and 5 labour days are needed to produce one unit of coal and steel respectively. If the economy requires 100 tonnes of coal and 50 tonnes of steel for consumption, calculate gross output and required labour.
- d) State the Euler's theorem. Prove the Euler's theorem taking a bivariate function.