

2022

(Repeaters)

(1st Semester)

ECONOMICS

(Honours)

Paper No. : ECO-102

[Quantitative Technique—I (Mathematics)]

Full Marks : 70

Pass Marks : 45%

Time : 3 hours

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

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. (a) What is function? Discuss the algebra of functions. 1+5=6
- (b) Solve : $\log_{10} \left(\frac{47 \times 32}{10 \times 16} \right)$ 4
- (c) Show that $\log_a b \cdot \log_b a = 1$ for $a, b > 0$;
 $a, b \neq 1$. 4

2. (a) What is Cartesian product? If $A = \{1, 2\}$,
 $B = \{a, b\}$, then find (i) $A \times B$, (ii) $B \times A$
and (iii) $A \times A$. 2+3=5
- (b) Discuss the choice problems. 5
- (c) What are the characteristics of the
equivalence relation? 4

UNIT—II

3. (a) What are natural numbers? 2
- (b) Discuss the axiom of real numbers and
the axioms of the field. 4+4=8
- (c) Solve the following equations : 4
- (i) $|x|=2$
- (ii) $\sqrt{x^2} = 7$
- (iii) $x = |2|$
- (iv) $|x - 2| = -5$
4. (a) What is analytical geometry? Discuss
the distance formula. 2+4=6
- (b) If the distance of a point $P(x, y)$ from the
origin is twice that from (a, b) , what is
the relation among x, y, a, b ? 4
- (c) Show that the points $(0, 2), (1, 5),$
 $(-1, -1)$ are collinear. 4

UNIT—III

5. (a) What is differentiation? Discuss average rate of change. 2+4=6
- (b) If $y = f(x) = x^2$, then $f(x + \Delta x) = (x + \Delta x)^2$. 4
- (c) Solve : $y = \frac{1}{x\sqrt{x}} = \frac{1}{x} \cdot \frac{1}{x^{1/2}}$ 4
6. (a) What is differential approximation? 4
- (b) Find $\tan^{-1} 0.999$. 6
- (c) Since $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = f'(x)$. 4

UNIT—IV

7. (a) What is consumer surplus? 3
- (b) Discuss diagrammatically consumer surplus. 7
- (c) Given the demand function $p = 25 - 2x$, find the equilibrium price p_0 and equilibrium quantity demanded x_0 with the help of the supply function $4p = 10 + x$. 4
8. (a) What is producer surplus? Explain it with a diagram. 2+2=4
- (b) Find the producer surplus for the supply function $p^2 - x = 9$ when $x_0 = 7$. 5

- (c) Show that if the demand and supply functions are given by $p = 36 - x^2$ and $4p - 6 = x^2$ the consumer and producer surpluses are $32\sqrt{6}$ and $8\sqrt{6}$. 5

UNIT—V

9. (a) What is determinant? What are the properties of determinant? 2+5=7

(b) Find $\begin{vmatrix} 1 & 3 & 2 \\ 0 & 2 & -1 \\ 4 & 1 & 5 \end{vmatrix}$. 3½

(c) Find $\begin{vmatrix} 2 & 1 & 0 \\ 3 & 2 & 4 \\ 1 & 2 & 3 \end{vmatrix}$. 3½

10. (a) Solve by Cramer's rule : 7

$$x + 6y - z = 10$$

$$2x + 3y + 3z = 17$$

$$3x - 3y - 2z = -9$$

- (b) Show that the matrix

$$A = \begin{vmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{vmatrix}$$

satisfies the equation $A^3 - 6A^2 + 9A - 4I = 0$. Hence find A^{-1} . 7

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