2021

(1st Semester)

ECONOMICS

(Honours)

Paper No. : ECO–102

(New Course)

(Quantitative Techniques—I)

Full Marks : 70

Pass Marks : 45%

Time : 3 hours

The figures in the margin indicate full marks for the questions

UNIT—I

1. *(a)* Given $A = \{a, b\}$, $B = \{4, 6\}$ and $C = \{5, 6\}$. Find—

(i) $A \times (B \cap C)$;

(ii) $(A \times B) \cap (A \times C)$.

Verify whether

$$A \times (B \cap C) = (A \times B) \cap (A \times C)$$ 3+3=6

(Turn Over)

(b) If

$U = \{j, k, l, m, n\}$, $X = \{j, k, m\}$ and $Y = \{k, m, n\}$

show that $(X \cap Y)' = X' \cup Y'$. 4

(c) If $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$, $P = \{4, 5, 6\}$ and $Q = \{5, 6, 8\}$, show that

$$(P \cup Q)' = P' \cap Q'$$ 4

OR

2. (a) Each student in a class of 40 plays at least one indoor game chess, carom and scrabble. 18 play chess, 20 play scrabble and 27 play carom. 7 play chess and scrabble, 12 play scrabble and carom and 4 play chess, carom and scrabble. Find the number of students who play—

(i) chess and carom;

(ii) chess, carom but not scrabble. 8

(b) Discuss the types of functions and their applications in economics. 6

UNIT—II

3. (a) Add $3+3i$ and $-4+i$ and subtract $3+3i$ from $-1+4i$ graphically. 3+3=6

(b) Discuss the axiomatic properties of real numbers. 8

OR

4. *(a)* Find the equation of a straight line that has y-intercept 4 and is perpendicular to straight line joining (2, –3) and (4, 2). 4

(b) Find the coordinates of the centre and radius of the circle whose equation is

$$3x^2 + 3y^2 - 6x + 9y - 4 = 0$$ 5

(c) Find the equation of a circle which passes through three points (0, 1), (5, 1) and (2, –3). 5

UNIT—III

5. *(a)* Find $\frac{dy}{dx}$ of the following : 4+3+3=10

(i) $x^2 + y^2 + 2x + 2y - 2 = 0$

(ii) $\frac{x^2 + 5}{x^2 + x}$

(iii) $(x + 2)(3x + 2)$

(b) Find the maximum and minimum values of the following function : 4

$$Y = 3x^4 - 10x^3 + 6x^2 + 5$$

OR

6. *(a)* Find E_d, if the demand function is $x = 25 - 4p + p^2$, where x is the demand for commodity at price p and find out the point elasticity at price level $p = 8$, $p = 4$ and $p = 5$. 5

(b) Discuss the relationship between average and marginal cost curves through differentiation. 4

(c) A firm has the following total cost and demand functions :

$$C = \frac{1}{3}Q^3 - 7Q^2 + 111Q + 50 \text{ and } Q = 100 - p$$

Find the profit maximising level of output; also find profit at this level of output. 5

UNIT—IV

7. Integrate the following : 2+4+4+4=14

(a) $\int (x^3 - 4x^2 + x)\,dx$

(b) $\int \frac{x^4 - 8}{x}\,dx$

(c) $\int 2x(x^2 + 1)\,dx$

(d) $\int \left(\frac{1}{x^2} + \frac{4}{x\sqrt{x}} + 2\right)dx$

OR

8. *(a)* If the demand function is $p = 85 - 4x - x^2$, what will be the consumer's surplus, if—

(i) $x_0 = 5$;

(ii) $p_0 = 64$? 8

(b) Find the producer's surplus when

$p_d = 3x^2 - 20x + 5,\ p_s = 15 + 9x$ 6

UNIT—V

9. *(a)* Solve the following equation through matrix inversion : 8

$$A = \begin{bmatrix} 3x - 2y + 3z = 8 \\ 2x + y - z = 1 \\ 4x - 3y + 2z = 4 \end{bmatrix}$$

(b) Discuss the properties of determinants. 6

OR

10. *(a)* Compute *(i)* $2A - 3B$ and *(ii)* ABC for the following matrices : 2+2=4

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \quad B = \begin{bmatrix} -1 & 2 \\ 2 & -1 \end{bmatrix} \quad C = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$$

(b) Write short notes on *(i)* diagonal matrix and *(ii)* symmetric matrix with examples. 2+2=4

(c) Solve the following set of equations by Cramer's rule method : 6

$$2x - 3y + 4z = 8$$
$$3x + 4y - 5z = -4$$
$$4x - 5y + 6z = -12$$

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