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(1st Semester)

ECONOMICS

(Honours)

Paper No. : Eco–102

[Quantitative Techniques—I (Mathematics)]

<u>Full Marks : 70</u>
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)* If

$U = \{x : x \in N \text{ and } x \leq 10\}$

$A = \{x : x \text{ is an odd number}\}$

$B = \{x : x \text{ is an even number}\}$

$C = \{x : x \text{ is a prime number}\}$

   (i) find $A - C$;

   (ii) find $A - (A \cup C)$;

   (iii) verify $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

$$2+2+2=6$$

(Turn Over)

(b) In a survey of 100 students, it was found that 50 used the college library, 40 had their own library and 30 borrowed books. Of these, 20 used both the college library and their own library. 15 used their own library and borrowed books and 10 used the college library and borrowed books. How many students used all the three sources? 8

2. (a) Write the properties of relations. 6

   (b) Write short notes on the following : 4+4=8

      (i) Venn diagram

      (ii) Inequalities in market equilibrium

UNIT—II

3. (a) Find the equation of straight line which passes through two points (2, 2) and (4, 8). 4

   (b) Solve the given quadratic equation $x^2 + 16x + 48 = 0$. 5

   (c) Find the point on the y-axis which is equidistant from (−3, 2) and (5, −2). 5

4. (a) Write the real and imaginary parts of the given complex number after putting it in the form of

   (i) $a + ib : (3 + 4i)^2$;

   (ii) $\dfrac{1 + 2i}{2 + i}$. $\hspace{3cm} 2+2=4$

   (b) Define circle. Show that the equation of the circle with centre $(2, -3)$ and radius is 5 units. $\hspace{2cm} 2+4=6$

   (c) Differentiate between isoprofit and isocost. $\hspace{3cm} 2+2=4$

UNIT—III

5. (a) Determine maxima and minima values of $x^3 - 6x^2 + 9x - 5$. $\hspace{2cm} 4$

   (b) State (i) Euler's theorem, and (ii) adding-up theorem. $\hspace{2cm} 2+2=4$

   (c) The total cost of output is given by

   $$C = \frac{2}{3}x + \frac{35}{2}$$

   Find—

   (i) cost when output is 4 units;

   (ii) average cost when output is 10 units;

   (iii) marginal cost when output is 3 units. $\hspace{2cm} 2+2+2=6$

6. (a) Find dy/dx if

   (i) $y = \dfrac{3x^2 + 1}{x^2}$;

   (ii) $y = (x^2 + 1)(x + 2)$. $3+3=6$

   (b) Find the integral of $x(x^2 - 1)^2$.   4

   (c) Differentiate between consumer's surplus and producer's surplus.   4

UNIT—IV

7. (a) Define determinant. Explain five properties of determinant. $2+5=7$

   (b) If

   $$A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$$

   show that $A^2 - 5A + 7I = 0$.   7

8. (a) Solve the following equations using Cramer's rule :   7

   $$x - 2y + 3z = 1$$
   $$3x - y + 4z = 3$$
   $$2x + y - 2z = -1$$

   (b) Solve the following equations using the matrix general method :   7

   $$3x + 3y - z = 11$$
   $$2x - y + 2z = 9$$
   $$4x + 3y + 2z = 25$$

UNIT—V

9. (a) What is linear programming? Explain the graphical method of linear programming. $2+6=8$

   (b) What are the basic assumptions of linear programming? 6

10. (a) Explain briefly the input-output model. 6

    (b) The inputs of coefficient of matrix of three sectors P, Q and R in an economy are given as

$$A = \begin{bmatrix} 0 \cdot 2 & 0 \cdot 6 & 0 \cdot 2 \\ 0 \cdot 3 & 0 \cdot 1 & 0 \cdot 3 \\ 0 \cdot 1 & 0 \cdot 2 & 0 \cdot 2 \end{bmatrix}$$

and final demands are given as

$$F = \begin{bmatrix} 50 \\ 60 \\ 40 \end{bmatrix}$$

Find out the gross output of all the sectors. 8

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