

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, June 2022

First Degree Programme under CBCSS

Mathematics

Complementary Course I for Economics

MM 1131.5 : MATHEMATICS FOR ECONOMICS – I

(2021 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – I

Answer **all** questions. Each question carries **1** mark.

1. Define the Universal set:
2. Is collection of intelligent students in a class a set? Justify your answer.
3. If $A = \{1, 2, 3, 4\}$ and $B = \{2, 3, 8, 9\}$, then find $A \cap B$.
4. If $U = \{1, 2, 3, \dots\}$ then list the elements of the set

$$A = \{x : x \in U, x \text{ is even, } x < 10\}$$

5. State transitive property of sets.
6. Find the solution of the equation $6x + 12 = 0$.

7. Write solutions of the equation $ax^2 + bx + c = 0$.
8. Find the degree of the equation $(x-2)^3 + 5x = (x-4)^2$.
9. Solve $2x - 4 = x$.
10. A market demand curve is given by $D = 12 - \frac{2p}{5}$. Find the amount demanded when commodity is a free good.

(10 × 1 = 10 Marks)

SECTION – II

Answer **any eight** questions. Each question carries **2** marks.

11. Find the complement A' of the set $A = \{1, 2, 3\}$, where the universal set $\Omega = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$.
12. If $A = \{1, 2, 3, 4, 5\}$ and $B = \{4, 5, 6, 7\}$ then find $A - B$ and $B - A$.
13. Find the power set of $A = \{2, 7, 9\}$.
14. Show that $A = \{2, 4, 5, 6, 8\}$ is not a subset of $B = \{x : x \text{ is an even integer}\}$.
15. If $A = \{0, 1\}$ and $B = \{a, b, c, d\}$, then find the Cartesian product $A \times B$.
16. Let $A = \{3, 4, 5, 6, 7, 8\}$ and R be the relation from A to A defined by $R = \{(x, y) : y = x - 1\}$ then find the domain and range of R .
17. Define a function.
18. Express the function f defined on $\{-2, -1, 0, 1, 2\}$ by $f(x) = x^2$ as a set of ordered pairs.

19. Solve the equation: $4x + 3 = 2x + 5$.

20. If 6 is added to thrice a number, then the result is 42. Determine the number.

21. Solve $(x - 2)^2 = 4$.

22. Determine whether the equation $x(x + 1) + 8 = (x + 2)(x - 2)$ is a quadratic equation. Justify your answer.

23. Solve the system of equations:

$$x - y = 5$$

$$x + y = 11$$

24. If the propensity to save in a country is given by the expression $S = 0.2y - 50$ and the level of investment is given by $I = 0.1y$ where y the income, find the equilibrium level of income.

25. If the total cost curve is $C = 2x^2 + 4x + 20$, find the fixed cost.

26. A market demand curve is given by $D = 62 - \frac{2p}{3}$, Find out the maximum price anybody will pay for the commodity.

(8 × 2 = 16 Marks)

SECTION – III

Answer **any six** questions. Each question carries **4** marks.

27. If A, B, C, D denote respectively the set of male passengers, the set of female passengers, the set of male children and the set of female children traveling in a bus, express in terms of set notation (a) set of children, (b) set of adults, (c) set of male adults and, (d) set of female adults.

28. Find the Cartesian product $A \times B \times C$ of the three sets $A = \{a, b\}$, $B = \{1, 2\}$ and $C = \{x, y\}$.
29. Find $X \times Y$ if $X = \{x : x = 1, 3, 5\}$ and $Y = \{y : y = x + 2\}$.
30. Let $A = \{2, 3, 4, 5\}$ $B = \{8, 9, 10, 11\}$. If R is the relation "is factor of" from A to B then express the relation R in tabular or roster form.
31. Let $A = \{1, 2, 3, 4\}$ and $B = \{-3, -2, -1, 1, 2, 3\}$. Determine whether the relation $R = \left\{ (x, y) : x \in A, y \in B; x = \frac{1}{y^2} \right\}$ is a functional relation. Justify your answer.
32. Let $A = \{2, 4, 5, 6\}$ and $B = \{2, 4, 5\}$. Find $A \times B$ and $B \times A$.
33. Solve the equation $\frac{x}{8} + \frac{x}{6} = \frac{x+1}{12} + \frac{x}{12} + 3$.
34. Solve $4x^2 - 3x = 7$.
35. Solve $(x-3)^2 + (x-2)^2 = 1$.
36. Solve the equation $\frac{x}{x-1} - \frac{x-1}{x} = \frac{3}{2}$.
37. Find the values of x and y that satisfy both of the equations:
- $$\begin{aligned} 2x + 3y &= 18 \\ 3x - 4y &= -7 \end{aligned}$$
38. Suppose the demand and supply curves of a commodity are given by $D = 1000 - p$ and $S = 700 + 2p$. Find the equilibrium price and quantity.

(6 × 4 = 24 Marks)

SECTION – IV

Answer **any two** questions. Each question carries **15** marks.

39. (a) Verify De Morgan's rule for the set $A = \{1, 2, 3, 5\}$ and $B = \{3, 4, 6, 7\}$ where the universal set $\Omega = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$. 6
- (b) If $X = \{1, 2, 4, 5\}$, $Y = \{4, 5, 6, 7\}$, $Z = \{2, 3, 5, 6\}$ and the universal set $\Omega = \{1, 2, 3, \dots, 9\}$ then find
- (i) $X' \cup Y' \cup Z'$
- (ii) $(X \cup Y)' \cap (Y \cap Z)$
- (iii) $(X \cup Y)' \cap (Y' \cup Z)$ 9
40. (a) If $A = \{2, 4, 6\}$, $B = \{1, 2\}$ and $C = \{3, 5\}$, find the Cartesian products $A \times B$, $A \times A$, $B \times B$ and $(A \cup B) \times C$. 7
- (b) If $A = \{1, 2\}$, $B = \{3, 4\}$ and $C = \{1, 4, 5\}$ then prove that
- (i) $A \times (B \cap C) = (A \times B) \cap (A \times C)$ 4
- (iii) $A \times (B \cup C) = (A \times B) \cup (A \times C)$ 4
41. (a) Let $A = \{0, 1, 2, 3\}$ and $x, y \in A$. Find the following relation in tabular form:
- (i) $x R_1 y$ if $y < x$
- (ii) $x R_2 y$ if $x = y$
- (iii) $x R_3 y$ if $x = 2y$

Also, find the domain and range in each case. 9

- (b) Let f be a function defined on the domain $\{-2, 1, 2, 3\}$ by $f(x) = x^3 - 4x^2 + 3$. Find $f(-2)$, $f(1)$, $f(2)$, $f(3)$ and the range of the function. 6

42. (a) Solve : $\frac{9x-8}{7} + \frac{x+0.2}{0.4} + \frac{2}{9} = 0$

6

(b) Solve : $\frac{2x-7}{2x-3} = \frac{x-7}{x+11}$

6

(c) Solve : $x^2 - 5x + 6 = 0$.

3

43. (a) Solve the system of linear equations :

7

$$6x - 5y = 4$$

$$8x - 3y = 4$$

(b) Find the values of x and y satisfy both of the equations :

8

$$\frac{2}{x} + \frac{3}{y} = 2$$

$$\frac{5}{x} + \frac{10}{y} = \frac{55}{6}$$

44. (a) Solve the system of linear equations :

4

$$3x + 5y = \frac{155}{14}$$

$$9x - 12y = \frac{-30}{7}$$

(b) Transform the equation $\frac{1}{x^4} - \frac{13}{x^2} + 36 = 0$ into quadratic equation and then solve it.

6

(c) Solve : $\sqrt{x} + \frac{8}{\sqrt{x}} = 6$.

5