Time: 1.5 Hours   **Max. Marks: 40**

General Instructions:

1. All questions are compulsory.

2. Section A contains 8 MCQs (1 mark each).

3. Section B contains 4 Very Short Answer questions (2 marks each).

4. Section C contains 3 Short Answer questions (3 marks each).

5. Section D contains 2 Long Answer questions (5 marks each).

6. Section E contains 1 Case Study (5 marks total).

Section A (Multiple Choice Questions)

1. The point of the form $(a, -a)$ always lies on the line:

    (a) $x = a$
    (b) $y = -a$
    (c) $x + y = 0$
    (d) $x - y = 0$

2. How many linear equations in x and y can have a solution $(2, 3)$?

    (a) Only one
    (b) Exactly two
    (c) Infinitely many
    (d) None

3. If $x = 1, y = 1$ is a solution of $9kx + 12ky = 63$, then the value of k is:

    (a) 3
    (b) 2
    (c) 7
    (d) 4

4. The graph of $x = a$ is a line parallel to:

    (a) X-axis
    (b) Y-axis
    (c) The line $y = x$
    (d) None of these

5. The equation $y = mx + c$ represents a line passing through the origin if:

(a) $m = 0$

(b) $c = 0$

(c) $m = c$

(d) $x = y$

6. Any solution of the linear equation $2x + 0y + 9 = 0$ in two variables is of the form:

(a) $(-9/2, n)$

(b) $(n, -9/2)$

(c) $(0, -9/2)$

(d) $(-9/2, 0)$

7. The linear equation $x - 2 = 0$ is:

(a) Parallel to X-axis

(b) Parallel to Y-axis

(c) Passing through $(2, 2)$

(d) Passing through origin

8. If the point $(3, 4)$ lies on the graph of $3y = ax + 7$, then the value of a is:

(a) $5/3$

(b) $3/5$

(c) 1

(d) $2/5$

Section B (Very Short Answer Questions)

1. Express $x = 3y$ in the form $ax + by + c = 0$ and find two points where it intersects the axes, if any. (2)

2. Find the value of k so that $x = -1, y = -1$ is a solution of $2x - ky = 9$. (2)

3. Write the equations of two lines passing through the point $(0, 4)$. (2)

4. Give the geometric representation of $2x + 9 = 0$ as an equation in two variables. (2)

Section C (Short Answer Questions)

1. If $(2k - 1, k)$ is a solution of the equation $10x - 9y = 12$, find the value of k. Hence, find one more solution for the equation. (3)

2. For the equation $y = \frac{3}{2}x + 1$, create a table of three solutions and plot them on a Cartesian plane. Does the line pass through the III quadrant? (3)

3. The force applied on a body is directly proportional to the acceleration produced in the body. Write an equation in two variables taking constant mass as 5 units. Draw the graph and find the force when acceleration is 2 units. (3)

Section D (Long Answer Questions)

1. Draw the graph of the equation $x + 2y = 6$. (i) Find the coordinates of the points where the graph cuts the X-axis and Y-axis. (ii) Find the area of the triangle formed by this line and the coordinate axes. (iii) Check from the graph if $(2, 2)$ is a solution. (5)

2. (i) Draw the graph of $y = x$ and $y = -x$ in the same graph paper. (ii) At what point do these lines intersect? (iii) Find the coordinates of the points on these lines whose ordinate is 3. (5)

Section E (Case Study Based Question)

Case Study: Thermal Modeling in Physics
A student is conducting an experiment to study the relationship between the Celsius (C) and Fahrenheit (F) scales of temperature. He discovers that the relationship is linear. The formula used is $F = \left(\frac{9}{5}\right) C + 32$. This equation allows scientists to convert temperatures between the two scales used globally. The student notices that at a certain temperature, both the numerical values on the Celsius and Fahrenheit scales are exactly the same. By plotting this equation on a graph, one can visualize how the Fahrenheit scale increases more rapidly than the Celsius scale. Understanding this linear relationship is fundamental in thermodynamics and weather forecasting, where precise conversions are necessary for data consistency across different regions.

Based on the above information, answer the following questions:

1. If the temperature is $30°C$, what is the temperature in Fahrenheit?

    (a) $86°F$
    (b) $94°F$
    (c) $72°F$
    (d) $102°F$

2. At what value are both Celsius and Fahrenheit scales numerically equal?

    (a) 40
    (b) -40
    (c) 0
    (d) 32

3. If the temperature is $0°C$, what is the temperature in Fahrenheit?

    (a) $0°F$
    (b) $32°F$
    (c) $-32°F$
    (d) $100°F$

4. What is the coefficient of C if the equation is written in the form $F - \left(\frac{9}{5}\right) C - 32 = 0$?

    (a) 1
    (b) 9/5

(c) $-9/5$

(d) -32

5. If the Fahrenheit temperature is $95°F$, the Celsius temperature is:

   (a) $35°C$

   (b) $25°C$

   (c) $45°C$

   (d) $30°C$