B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

PRE MID TERM 2025-26
MARKING SCHEME - MATHEMATICS

Class: XI | **Time: 1hr**
Date: 02/08/25 | **Max Marks: 25**
Admission no: | **Roll no:**

General Instructions:

1. This Question Paper has 4 Sections A, B, C and D.
2. Section A has 5 MCQs carrying 1 mark each
3. Section B has 2 questions carrying 02 marks each.
4. Section C has 2 questions carrying 03 marks each.
5. Section D has 2 questions carrying 05 marks each.
6. All Questions are compulsory.

SECTION A

1. Empty set is a _____. **1m**
(a) Infinite set *(b) Finite set* (c) Unknown set (d) None of these

2. The number of elements in the Power set P(S) of the set S = {1, 2, 3} is **1m**
(a) 4 *(b) 8* (c) 2 (d) None of these

3. If $f(x) = x^2 + 2$, $x \in R$, then the range of f(x) is **1m**
(a) *$[2, \infty)$* (b) $(-\infty, 2]$ (c) $(2, \infty)$ (d) None of these

4. If f(x) = ax + b, where a and b are integers, f(–1) = – 5 and f(3) = 3, then a and b are equal to **1m**
(a) a = – 3, b = –1 *(b) a = 2, b = – 3* (c) a = 0, b = 2 (d) None of these

5. Let n (A) = m, and n (B) = n. Then the total number of non-empty relations that can be defined from A to B is **1m**

(a) m^n (b) $n^m - 1$ (c) $mn - 1$ *(d) $2^{mn} - 1$*

SECTION B

6. **List all the elements of following sets:** **2m**

A = $\{x : x \text{ is an integer}, -1 < x < 5\}$

B = $\{x : x \text{ is a vowel in the English alphabet which precedes } k\}$

A:- **A = { 0,1,2,3,4}** **1m**

B = { O,U} **1m**

7. **Find the domain and the range of the function: f (x) = $\sqrt{x^2 - 4}$** **2m**

A:- Ans: Given, $f(x) = \sqrt{x^2 - 4}$; For D_f, $f(x)$ must be a real number.

$\Rightarrow \sqrt{x^2 - 4}$ must be a real number. $\Rightarrow x^2 - 4 \geq 0 \Rightarrow (x + 2)(x - 2) \geq 0$

$\Rightarrow$ Either $x \leq -2$ or $x \geq 2$. $\Rightarrow D_f = (-\infty, -2] \cup [2, \infty)$. **1m**

For R_f, let $y = \sqrt{x^2 - 4}$ ... (*i*)

As square root of a real number is always non-negative, $y \geq 0$.

On squaring (*i*), we get $y^2 = x^2 - 4 \Rightarrow x^2 = y^2 + 4$ but $x^2 \geq 0 \; \forall \; x \in D_f$.

$\Rightarrow y^2 + 4 \geq 0 \Rightarrow y^2 \geq -4$, which is true $\forall \; y \in R$,

Also, $y \geq 0$. $\Rightarrow R_f = [0, \infty)$. **1m**

SECTION C

8. **Write the following as intervals:** **3m**

(i) $\{x : x \in R, -2 < x < 5\}$

(ii) $\{x : x \in R, -2 \leq x < 5\}$

(iii) $\{x : x \in R, -2 \leq x \leq 5\}$

A:- (i) $(-2, 5)$ **1m**

(ii) $[-2, 5)$ **1m**

(iii) $[-2, 5]$ **1m**

9. **If f and g are two real valued functions defined as f(x) = 2x + 1, g(x) = x^2 + 1, then find.** **3m**

(i) f + g (ii) f - g (iii) fg (iv)f/g

A:- f and g be real valued functions defined as f (x) = 2x + 1, g (x) = x^2 + 1,

(i) f + g

$\Rightarrow f + g = f(x) + g(x)$

$= 2x + 1 + x^2 + 1$

$= x^2 + 2x + 2$

(ii) f – g

$\Rightarrow f - g = f(x) - g(x)$ **1m**

$= 2x + 1 - (x^2 + 1)$

$= 2x - x^2$

(iii) fg

$\Rightarrow fg = f(x)\, g(x)$ **1m**

$= (2x + 1)(x^2 + 1)$

$= 2x(x^2) + 2x(1) + 1(x^2) + 1(1)$

$= 2x^3 + 2x + x^2 + 1$

$= 2x^3 + x^2 + 2x + 1$ **1m**

SECTION D

10. **(a) If U = {1,2,3,4,5,6,7,8,9}, A= {2,4,6,8} and B = {2,3,5,7}** **5m**
Verify that (i) (A U B)' = A' ∩ B'
(ii) (A ∩ B)' = A' U B'

(b) Draw appropriate Venn diagram for each of the following:
(i) (A U B)'
(ii) (A ∩ B)'

A:- **(a)Values of (A U B)', A' ∩ B' ,(A ∩ B)' , A' U B'** **2m**
Verification **1m**
(b) Venn diagrams **2m**

11. **Maths teacher started the lesson Relations and Functions in Class XI. He explained the following topics:** **5m**
Ordered Pairs: The ordered pair of two elements a and b is denoted by (a, b): a is first element (or first component) and b is second element (or second component). Two ordered pairs are equal if their corresponding elements are equal. i.e., (a, b) = (c, d) ⇒ a = c and b = d
Cartesian Product of Two Sets: For two non-empty sets A and B, the cartesian product A x B is the set of all ordered pairs of elements from sets A and B. In symbolic form, it can be written as A x B= {(a, b): a ∈ A, b ∈ B}
Based on the above topics, answer the following questions.
(i) If (a – 3, b + 7) = (3, 7), then find the value of a and b
(ii) If (x + 6, y – 2) = (0, 6), then find the value of x and y
(iii) If (x + 2, 4) = (5, 2x + y), then find the value of x and y
(iv) Find x and y, if (x + 3, 5) = (6, 2x + y).

A:- (i) We know that, two ordered pairs are equal, if their corresponding elements are equal.
$(a - 3, b + 7) = (3, 7)$ **1m**
$\Rightarrow a - 3 = 3$ and $b + 7 = 7$ [equating corresponding elements]
$\Rightarrow a = 3 + 3$ and $b = 7 - 7 \Rightarrow a = 6$ and $b = 0$
(ii) $(x + 6, y - 2) = (0, 6)$
$\Rightarrow x + 6 = 0 \Rightarrow x = -6$ and $y - 2 = 6 \Rightarrow y = 6 + 2 = 8$ **1m**
(iii) $(x + 2, 4) = (5, 2x + y)$
$\Rightarrow x + 2 = 5 \Rightarrow x = 5 - 2 = 3$ and $4 = 2x + y \Rightarrow 4 = 2 \times 3 + y \Rightarrow y = 4 - 6 = -2$ **1m**
(iv) $x + 3 = 6, 2x + y = 5 \Rightarrow x = 3, y = 1$ **2m**

******BEST OF LUCK******