Topic: Modulus Equation & Inequality

Sub: Mathematics **Assignment: 02 Repeater** Prof. Chetan Sir

Que.1 Solve the following questions

1. Let $A = \{x \in R : |x+1| < 2\}$ and $B = \{x \in R : |x-1| \geq 2\}$. Then which one of the following statements is NOT true? **[JEE Main 2022]**

(A) $A - B = (-1, 1)$
(B) $B - A = R - (-3, 1)$
(C) $A \cap B = (-3, -1]$
(D) $A \cup B = R - [1, 3)$

2. If $A = \{x \in R : |x| < 2\}$ and $B = \{x \in R : |x-2| \geq 3\}$; then: **[JEE Main 2020]**

(A) $A \cap B = (-2, -1)$
(B) $B - A = R - (-2, 5)$
(C) $A \cup B = R - (2, 5)$
(D) $A - B = [-1, 2)$

3. Let $S = \{x \in [-6, 3] - \{-2, 2\} : \frac{|x+3|-1}{|x|-2} \geq 0\}$ and $T = \{x \in Z : x^2 - 7|x| + 9 \leq 0\}$. Then the number of elements in $S \cap T$ is: **[JEE Main 2022]**

4. The number of real roots of the equation $x|x| - 5|x+2| + 6 = 0$ is: **[JEE Main 2023]**

(A) 5 (B) 4 (C) 6 (D) 3

5. For $x \in R$, the number of real roots of the equation $3x^2 - 4|x^2 - 1| + x - 1 = 0$ is: **[JEE Adv. 2021]**

6. The number of real solutions of the equation $x|x+5| + 2|x+7| - 2 = 0$ is: **[JEE Main 2024]**

7. The number of distinct real roots of the equation $|x+1||x+3| - 4|x+2| + 5 = 0$ is: **[JEE Main 2024]**

8. The number of real solutions of the equation $x(x^2 + 3|x| + 5|x-1| + 6|x-2|) = 0$ is: **[JEE Main 2024]**

9. The number of real roots of the equation $5 + |2^x - 1| = 2^x(2^x - 2)$ is: **[JEE Main 2019]**

(A) 2 (B) 3 (C) 1 (D) 4

10. The number of real solutions of the equation, $x^2 - |x| - 12 = 0$ is: **[JEE Main 2021]**

(A) 2 (B) 3 (C) 1 (D) 4

11. The product of the roots of the equation $9x^2 - 18|x| + 5 = 0$ is: **[JEE Main 2020]**

(A) $\frac{5}{9}$ (B) $\frac{25}{81}$ (C) $\frac{5}{27}$ (D) $\frac{25}{9}$

12. The number of the real roots of the equation $(x+1)^2 + |x-5| = \frac{27}{4}$ is _____. **[JEE Main 2021]**

13. Let S be the set of all real roots of the equation, $3^x(3^x-1)+2=|3^x-1|+|3^x-2|$, then S: [**JEE Main 2020**]

(A) contains exactly two elements. (B) is a singleton.
(C) is an empty set. (D) contains at least four elements.

14. The sum of the solutions of the equation $|\sqrt{x}-2|+\sqrt{x}(\sqrt{x}-4)+2=0$, $(x>0)$ is equal to: [**JEE Main 2019**]

(A) 10 (B) 9 (C) 12 (D) 4

15. The sum of all the roots of the equation $|x^2-8x+15|-2x+7=0$ is: [**JEE Main 2023**]

(A) $9-\sqrt{3}$ (B) $9+\sqrt{3}$ (C) $11-\sqrt{3}$ (D) $11+\sqrt{3}$

16. The sum of the squares of all the roots of the equation $x^2+|2x-3|-4=0$, is: [**JEE Main 2025**]

(A) $3(3-\sqrt{2})$ (B) $6(3-\sqrt{2})$ (C) $6(2-\sqrt{2})$ (D) $3(2-\sqrt{2})$

17. The sum of the squares of the roots of $|x-2|^2+|x-2|-2=0$ and the squares of the roots of $x^2-2|x-3|-5=0$, is: [**JEE Main 2025**]

(A) 26 (B) 36 (C) 30 (D) 24

18. The number of elements in the set $\{n\in\mathbb{Z}:|n^2-10n+19|<6\}$ is _____. [**JEE Main 2023**]

19. The number of distinct real roots of the equation $|x|x+2|-5|x+1|-1=0$ is _____. [**JEE Main 2024**]

20. The number of elements in the set $\{x\in\mathbb{R}:(|x|-3)|x+4|=6\}$ is equal to [**JEE Main 2021**]

(A) 3 (B) 2 (C) 4 (D) 1

Answer Key (Que 1)

1	(B)	**2**	(B)	**3**	(3)	**4**	(D)	**5**	(4)	**6**	(3)	**7**	(2)	**8**	(1)	**9**	(C)	**10**	(A)
11	(B)	**12**	(2)	**13**	(B)	**14**	(A)	**15**	(B)	**16**	(C)	**17**	(B)	**18**	(6)	**19**	(3)	**20**	(B)

Que.2 Solve the following equations

(i) $|x-2|=3$

(ii) $|3x-2|=x$

(iii) $|x+1|+|x-1|=2$

(iv) $||x-1|-2|=1$

(v) $|x|+|x-2|=2$

(vi) $x^2-7|x|-8=0$

(vii) $(x-3)^2+|x-3|-11=0$

(viii) $|x-1|+|x-5|=6$

(ix) $|x-3|+2|x+1|=4$

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

(xi) $|x+1|+|x-1|=|2x|$

Que.3 Solve the following equations

(i) $|x|+2|x-6|=12$

(ii) $||x+3|-5|=2$

(iii) $|||x-2|-2|-2|=2$

(iv) $|4x+3|+|3x-4|=12$

(v) $x^2-7|x|-8=0$

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

(vii) $|x^3-6x^2+11x-6|=6$

(viii) $|x^2-2x|+x=6$

(ix) $|x^2-x-6|=x+2$

Que.4 Find the number of real roots of the equation

(i) $|x^2-3|x|+2|=0$

(ii) $||x-1|-5|=2$

(iii) $|2x^2+x-1|=|x^2+4x+1|$

Que.5 Find the sum of solutions of the following equations

(i) $x^2-5|x|-4=0$

(ii) $(x-3)^2+|x-3|-11=0$

(iii) $|x|^3-15x^2-8|x|-11=0$

(iv) $||x-3|-4|=1$

(v) $2^{|x|}+3^{|x|}+4^{|x|}=9$

Answer Key

Que.2

(i) -1, 5
(ii) $x = 1/2$ or $x = 1$
(iii) $x \in [-1, 1]$
(iv) 0, 2, 4
(v) $0 \leq x \leq 2$
(vi) ± 8
(vii) No solution
(viii) $x = 0$ or 6
(ix) $x = -1$
(x) 0, 1
(xi) $x \in (-\infty, -1] \cup [1, \infty)$

Que.3

(i) 0, 8
(ii) -10, -6, 0, 4
(iii) 0, ± 4, 8
(iv) $-\frac{11}{7}, \frac{13}{7}$
(v) ± 8
(vi) 0, 1
(vii) 0, 4
(viii) -2, 3
(ix) $x \in \{-2, 2, 4\}$

Que.4

(i) 4
(ii) 4
(iii) 4

Que.5

(i) 0
(ii) 6
(iii) 0
(iv) 12
(v) 0