Fundamental of Mathematics - II

Exercise-1

A-1. **Sol.** $|x| + 2 = 3 \Rightarrow |x| = 1 \Rightarrow x = \pm 1$

so sum of solutions = 1 – 1 = 0

A-2. **Sol.** $|x|^2 + 3|x| + 2 = 0$

$(|x| + 2)(|x| + 1) = 0$

$|x| = -2$ $\qquad$ $|x| = -1$

x = Not possible $\qquad$ x = Not possible

so no solution is possible

A-3. ***Sol.*** $3|x - 3| = 7 \quad \Rightarrow x - 3 = \pm\frac{7}{3} \quad$ *so* $x = \frac{16}{3}, \frac{2}{3}$

Product of roots = $\frac{32}{9}$

A-4. **Sol.** $|x|^2 - |x| + 4 = 2x^2 - 3|x| + 1 \quad \Rightarrow |x|^2 - 2|x| - 3 = 0 \quad \Rightarrow |x| - 3 = 0$ or $|x| + 1 = 0$ not possible

$\Rightarrow x = \pm 3$ $\qquad$ so sum of solutions = 0

A-5. **Sol.** $|x|^2 + |x| - 6 = 0$

assume that $|x| = t$

$t^2 + t - 6 = 0$

$(t - 2)(t + 3) = 0$

$t = 2, -3$

so $|x| = 2$ and $|x| = -3$ not possible

$\Rightarrow x = \pm 2$

roots are real & sum = 0

A-6. **Sol.** $||x - 1| - 2| = 1$

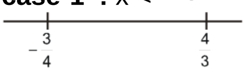
$|x - 1| - 2 = 1$ or $|x - 1| - 2 = -1$

$|x - 1| = 3 \qquad |x - 1| = 1 \qquad \Rightarrow x - 1 = \pm 3 \quad \Rightarrow x - 1 = \pm 1 \quad \Rightarrow x = 4, -2 \quad \Rightarrow x = 2, 0$

$\therefore x = -2, 0, 2, 4$

A-7. **Sol.** $|4x + 3| + |3x - 4| = 12$

case-1 : $x < -\frac{3}{4}$



$-4x - 3 - 3x + 4 = 12$

$-7x = 11$

$x = -\frac{11}{7}$

case-2 : $-\frac{3}{4} \le x \le \frac{4}{3}$

$4x + 3 - 3x + 4 = 12$

x = 5, not acceptable.

case-3 : $x \ge \frac{4}{3}$

$4x + 3 + 3x - 4 = 12$

$7x = 13$

$x = \frac{13}{7}$

$\therefore \quad x = -\frac{11}{7}, \frac{13}{7}$.

A-8. Sol. $|x - 3| + 2|x + 1| = 4$

case (i) : $x < -1$

$-x + 3 - 2x - 2 = 4$

$-3x = 3$

$x = -1$

case (ii) : $-1 \le x < 3$

$-x + 3 + 2x + 2 = 4$

$x = -1$

case (iii) : $x \ge 3$

$x - 3 + 2x + 2 = 4$

$3x = 5$

$x = \frac{5}{3}$

not possible

$\therefore \quad x = -1$

so number of real solutions is one.

A-9. Sol. $|x| - 2x + 5 = 0$

case (i) : $x < 0$

$-x - 2x + 5 = 0$

$\Rightarrow \quad x = \frac{5}{3} \qquad x < 0$

not possible $\quad (\because \ x < 0)$

case (ii) : $x \ge 0$

$x - 2x + 5 = 0 \qquad \therefore \qquad x = 5$

so number of solutions is one.

A-10. Sol. $|x - 2| = x^2$

so $x - 2 = \pm x^2$

$x^2 - x + 2 = 0$ no real solution

or $x^2 + x - 2 = 0 \qquad \Rightarrow (x + 2)(x - 1) = 0$

$x = 1, -2$

A-11. Sol. $|x + 2| = 2(3 - x)$

if $3 - x \ge 0 \Rightarrow x \le 3$

then $x + 2 = 6 - 2x$ or $x + 2 = 2x - 6$

$3x = 4 \qquad$ or $x = 8$ (not possible)

$x = \frac{4}{3}$ (possible)

so number of solutions = 1

A-12. Sol. $x|x| = 4$

case (i) : $x < 0 \ \therefore \qquad -x^2 = 4$

no solution.

case (ii) : $x \ge 0$

$x^2 = 4$

$x = \pm 2 \qquad \therefore \qquad x = 2$

so number of solutions = 1

A-13. **Sol.** $|x^2-4x+3| \Rightarrow \begin{cases} x^2-4x+3 & (x-1)(x-3) \ge 0 \\ -(x^2-4x+3) & (x-1)(x-3)<0 \end{cases}$

$y = x^2-4x+3+x=7$

$x^2-4x+3+7-x=0$

A-14. **Sol.** $f(x) = |x-1| + |x-2| + |x-3|$

$$= \begin{cases} -x+1-x+2-x+3=6-3x, & x \le 1 \\ x-1-x+2-x+3=4-x & 1<x\le 2 \\ x-1+x-2-x+3=x & 2<x\le 3 \\ x-1+x-2+x-3=3x-6 & x>3 \end{cases}$$

min f(x) = 2.

A-15. **Sol.** $||x-1|-2| = |x-3|$

by using property

$||a|-|b|| = |a-b| \Rightarrow a.b \ge 0$

$2(x-1) \ge 0 \Rightarrow x \ge 1 \Rightarrow x \in [1, \infty)$

Section (B) : Modulus Inequalities

B-1. **Sol.** $|x-3| \ge 2$

$x-3 \ge 2$ or $x-3 \le -2$

$x \ge 5$ or $x \le 1$

B-2. **Sol.** $|x-2|-3 = 0$

$|x-2| = 3$

$x = 5$ or $x = -1$

sum of integral solutions = 4

B-3. **Sol.** $|x+3| > |2x-1| \Rightarrow x^2+9+6x > 4x^2+1-4x \Rightarrow 3x^2-10x-8<0$

$\Rightarrow \left(x+\frac{2}{3}\right)(x-4) < 0 \Rightarrow -\frac{2}{3} < x < 4$

So integral solutions are x = 0, 1, 2, 3

B-4. **Sol.** $-1 \le |x-1|-1 \le 1 \Rightarrow 0 \le |x-1| \le 2$

$\therefore\ 0 \le |x-1| \Rightarrow x \in R$ ...(1)

and $|x-1| \le 2 \Rightarrow -2 \le x-1 \le 2 \Rightarrow -1 \le x \le 3$ ...(2)

by (1) $\cap$ (2) $\Rightarrow x \in [-1, 3]$.

B-5. **Sol.** $|3x-9|+2 > 2$ or $|3x-9|+2 < -2$

$|3x-9| > 0$ or $x \in \varphi$

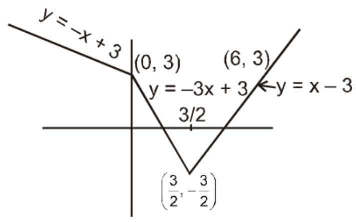
$x \in R - \{3\}$

B-6. **Sol.** $1+\frac{3}{x} > 2$ or $1+\frac{3}{x} < -2$

$\Rightarrow \frac{3-x}{x} > 0$ or $\frac{x+1}{x} < 0 \Rightarrow 0<x<3$ or $-1<x<0$

$\Rightarrow x \in (-1, 0) \cup (0, 3)$

B-7. **Sol.**



for $y \le 3$ $x \in [0, 6]$

Integral solutions $x = 0, 1, 2, 3, 4, 5, 6$

Number of integral solutions = 7

Comprehension # 1 (B-8 to B-10)

B-10. **Sol.** Case I when $1+\frac{3}{x} \ge 0 \Rightarrow \frac{x+3}{x} \ge 0$

then $x(x + 3) \ge 0$ $(x \ne 0)$

$\Rightarrow$ $x \in (-\infty, -3] \cup (0, \infty)$ ..... (i)

Now for above interval

$\left|1+\frac{3}{x}\right| > 2 \Rightarrow 1 + \frac{3}{x} > 2$

$\Rightarrow$ $1 - \frac{3}{x} < 0 \Rightarrow x(x - 3) < 0$ $(x \ne 0) \Rightarrow x \in (0, 3)$ ..... (ii)

from (i) and (ii) $x \in (0, 3)$

Case II when $1+\frac{3}{x} < 0$

then $x \in (-3, 0)$ ..... (iii)

Now $\left|1+\frac{3}{x}\right| > 2 \Rightarrow -\left(1+\frac{3}{x}\right) > 2$

$\Rightarrow$ $3+\frac{3}{x} < 0 \Rightarrow x(x + 1) < 0$ $(\because x \ne 0)$

$\Rightarrow$ $x \in (-1, 0)$ ..... (iv)

from (iii) and (iv) $x \in (-1, 0)$

$\therefore$ Total solution set for

$\left|1+\frac{3}{x}\right| > 2$ is

$x \in (-1, 0) \cup (0, 3)$

it with $(a, 0) \cup (0, b)$ we get $a = -1$, $b = 3$

8. $\therefore$ $|a + b| = |-1 + 3| = 2$

9. $\because$ $x^3 - kx^2 + x + 2$ is divisible by $x - a$ i.e. $(x + 1)$

so $f(-1) = 0$

$-1 - k - 1 + 2 = 0$

$\Rightarrow k = 0$

10. $(x + 1)^2 < (7x - 3)$

$\Rightarrow$ $x^2 + 2x + 1 < (7x - 3) \Rightarrow x^2 - 5x + 4 < 0 \Rightarrow (x - 1)(x - 4) < 0$

$\Rightarrow$ $x \in (1, 4)$

$\therefore$ $c = 1, d = 4$

$\therefore$ $a + b + c + d = -1 + 3 + 1 + 4 = 7$

B-11. **Sol.** $y = \begin{cases} -2x + 1, & x \in (-\infty, -1) \\ 3 & x \in [-1, 2) \\ 2x - 1 & x \in [2, \infty) \end{cases}$ $y \ge 3$ $\forall x \in R$

Section (C) : Irrational inequalities

C-1. **Sol.** $\sqrt{6-x} > x - 1$

Domain $6 - x \geq 0 \Rightarrow x \leq 6$

Case I : $x \geq 1$

+ve ≥ +ve

$6 - x \geq x^2 - 2x + 1$

$x^2 - x - 5 \leq 0$

$\left(x - \frac{1}{2}\right)^2 - \frac{21}{4} \leq 0 \quad \Rightarrow x \in \left[\frac{1-\sqrt{21}}{2}, \frac{1+\sqrt{21}}{2}\right]$

so $x \in \left[1, \frac{1+\sqrt{21}}{2}\right]$

Case 2 : $x < 1$

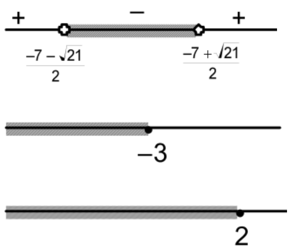
+ve > –ve

always true

$x \in (-\infty, 1)$

$\therefore x \in \left(-\infty, \frac{1+\sqrt{21}}{2}\right]$

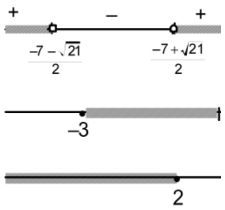
C-2. **Sol.** Case-I $x + 3 < 0$ and $2 - x \geq 0$ and $(x + 3)^2 < 2 - x \Rightarrow x^2 + 7x + 7 < 0$



$x \in \left(\frac{-7-\sqrt{21}}{2} - 3\right)$

Case – II $x + 3 \geq 0$ and $2 - x \geq 0$

$(x + 3)^2 > 2 - x \Rightarrow x^2 + 7x + 7 > 0$



$x \in \left(\frac{-7+\sqrt{21}}{2}, 2\right]$

Finally $x \in \left(\frac{-7-\sqrt{21}}{2} - 3\right) \cup \left(\frac{-7+\sqrt{21}}{2}, 2\right]$

C-3. **Sol.** $\sqrt{x^2 - x - 6} < 2x - 3$

Domain $x^2 - x - 6 \geq 0 \Rightarrow (x - 3)(x + 2) \geq 0$

$\Rightarrow x \in (-\infty, -2] \cup [3, \infty)$

Case : $x < \frac{3}{2}$

(+ve) < (–ve)

Never true

$\therefore\ x = \varphi$

Case : $x \geq \frac{3}{2}$

(+ve) < (+ve)

squaring

$x^2 - x - 6 < 4x^2 + 9 - 12x$

$\Rightarrow 3x^2 - 11x + 15 > 0$ $\quad \Rightarrow x^2 - \frac{11}{3}x + 5 > 0$ $\quad \Rightarrow D = \frac{121}{9} - 20 < 0$

$\therefore\ x \in R \Rightarrow x \in \left[\frac{3}{2}, \infty\right)$

Now take intersection with domain

$\therefore\ x \in [3, \infty)$

C-4. Sol. Domain

$x^2 + 4x - 5 \geq 0$;

$x^2 + 5x - x - 5 \geq 0$

$(x - 1)(x + 5) \geq 0$

$x \in (-\infty, -5] \cup [1, \infty)$

case-I $x - 3 < 0$

$x < 3$

–ve < +ve

always true

$\therefore$ $x \in (-\infty, -5] \cup [1, 3)$ ...(i)

case-II $x - 3 \geq 0$

$x \geq 3$

+ve < +ve

$(x - 3)^2 < (x^2 + 4x - 5)$

$10x - 14 > 0$

$x > 7/5$

$\therefore x \in [3, \infty)$ ...(ii)

by (i) $\cup$ (ii)

$x \in (-\infty, -5] \cup [1, \infty)$

C-5. Sol. **Case-I** $4 - x < 0$ and $2x - x^2 \geq 0 \Rightarrow x \in [0,2]$ and $x > 4 \Rightarrow x \in \varphi$

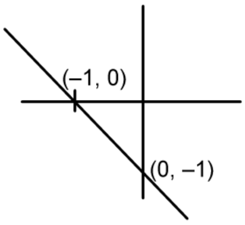
Case-II $4 - x \geq 0$ and $2x - x^2 \geq 0$ and $16 + x^2 - 8x < 2x - x^2$

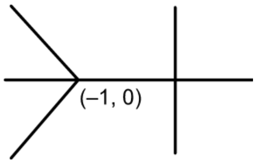
$\Rightarrow x \in [0,2]$ and $x > 4$ and $x^2 - 5x + 8 < 0 \Rightarrow x \in \varphi$

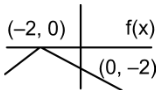
Section (D) : Transformation of curves

D-1. Sol. $|y| = -x - 1$

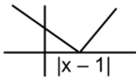
$y = -x - 1$ $\qquad$ $|y| = -x - 1$

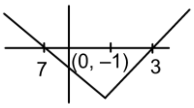


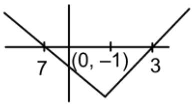


D-4. **Sol.** $f_1(x) = -|x + 2| =$ 

$f_2(x) = ||x - 1| - 2|$







$||x - 1| - 2|$

$f_3(x) = |\alpha + 2| + |x - 3|$

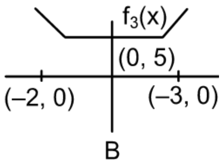
$x \geq 3$ $2x - 1$

$f_3(x) = |x + 2| + |x - 3|$

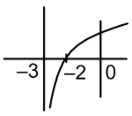
$x \geq 3$ $2x - 1$

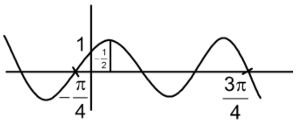
$-2 \leq x < 3$ 5

$t < -2$ $-2x + 1$

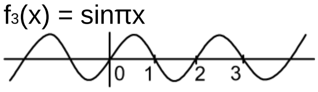


D-5. **Sol.** $f_1(x) = \ell n(x + 3)$ $f_2(x) = \cos\left(x - \frac{\pi}{4}\right)$





$f_3(x) = \sin\pi x$



Section (E) : Greatest Integer [·] Fractional part {·} and signum function

E-1. **Sol.** $[e] - [-\pi] = [2.71] - [-3.14] = 2 + 4 = 6$

E-2. **Sol.** $-5 \leq [x + 1] < 2$

$-5 \leq [x + 1] \leq 1 \Rightarrow -5 \leq x + 1 < 2$

$-6 \leq x < 1 \Rightarrow x \in [-6, 1)$

E-3. **Sol.** $[x]^2 + 5[x] - 6 < 0$

$\Rightarrow ([x] + 6)([x] - 1) < 0$

$\Rightarrow -6 < [x] < 1$

$\Rightarrow -5 \leq [x] \leq 0$

$\Rightarrow -5 \leq x < 1 \Rightarrow x \in [-5, 1)$

E-4. **Sol.** $\{x\} = 0$ or $\{x\} = -1$

$x \in I$ (rejected)

E-5. **Sol.** $2\{x\}^2 - 5\{x\} + 2 = 0$

$2f^2 - 4f - f + 2 = 0$

$2f(f - 2) - 1(f - 2) = 0$

$f = \frac{1}{2}, 2,\ f \neq 2\ (0 \le f < 1) \Rightarrow f = \frac{1}{2} \Rightarrow \infty$ solution

E-6. **Sol.** $\text{sgn}(x^2) = |x - 2|$

$1 = x - 2 \quad x \ge 2$

$x = 3$

$1 = -(x - 2) \quad x < 2$

$-1 = x - 2$

$x = 1$ two solution

E-7. **Sol.** $\text{sgn}\ x = |1-x|$

Case-I $0 > x$

$-1 = 1 - x \Rightarrow x = 2$ no solution

Case-II $x = 0$

$0 = 1$ not possible

Case-III $0 < x \le 1$

$1 = 1 - x \Rightarrow x = 0$ no solution

Case-IV $x > 1$

$1 = x - 1 \Rightarrow x = 2$ Ans.

Exercise-2

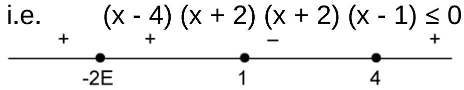
Marked Questions may have for Revision Questions.

PART - I : OBJECTIVE QUESTIONS

1. **Sol.** Since $(x^2 + x - 2) - (x^2 - 2x - 8) = 3x + 6 = 3(x+2)$

$\therefore$ $(x^2 - 2x - 8)(x^2 + x - 2) \le 0$

i.e. $(x - 4)(x + 2)(x + 2)(x - 1) \le 0$



$\therefore$ Solution set is $[1,4] \cup \{-2\}$

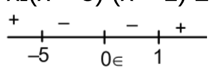
2. **Sol.** $|x^3 - 9x^2 + 26x - 24| = |x-2|\,|x-3|\,|x-4|$

When $x \in I$; above 3 are consecutive positive integers, hence multiplication can never be a prime number

3. **Sol.** $|a| + |b| = |a + b| \Rightarrow a.b. \ge 0$

$x(x + 5)(x)(1 - x) \ge 0$

$x^2(x + 5)(x - 1) \le 0$



$x \in [-5,1] \Rightarrow \{-5, -4, -3, -2, -1, 0, 1\}$

4. **Sol.**

$$f(x) = \begin{cases} x-3 & -\infty < x < -1 \\ 3x-1 & -1 \le x < 1 \\ -x+3 & 1 \le x < \infty \end{cases}$$

max at $x = 1$ $\quad f(1) = 2 - 2|1 - 1| = 2$

5. **Sol.** $||x| - 2| = 2$

$|x| - 2 = \pm 2$

$|x| = 4, 0$

$x = \pm 4, 0$

$\therefore$ order pairs are (4,3) (–4,3) (0,1)

6. **Sol.** $-1 \le \dfrac{3x}{x^2 - 4} \le 1$

$\dfrac{3x + x^2 - 4}{x^2 - 4} \ge 0$ and $\dfrac{3x - x^2 + 4}{x^2 - 4} \le 0$

$\Rightarrow \dfrac{(x+4)\ \ (x-1)}{(x-2)\ \ (x+2)} \ge 0$ and $\dfrac{(x-4)\ \ (x+1)}{(x-2)\ \ (x+2)} \ge 0$

$x \in (-\infty, -4] \cup (-2, 1] \cup (2, \infty)$ and $x \in (-\infty, -2) \cup [-1, 2) \cup [4, \infty)$

Taking intersection we get

$x \in (-\infty, -4] \cup [-1, 1] \cup [4, \infty)$

7. **Sol.** $\because \quad | a | + | b | \ge | a - b |$

$| a | + | -b | \ge | a + (-b) |$

but given inequality is $| 2x - 3 | + | x + 5 | \le | x - 8 |$

$| 2x - 3 | + | x + 5 | \le |(2x - 3) - (x + 8)| \Rightarrow | a | + | -b | = | a + (-b) |$

$\Rightarrow a (- b) \ge 0$ i.e. $ab \le 0$

$\therefore$ solution set is given by $(2x - 3) (x + 5) \le 0$

i.e. $-5 \le x \le 3/2$

so positive integer solution is $x = 1$.

8. **Sol.** **case-I: :** $x \ge -3$

$\Rightarrow \dfrac{2x + 3 - x - 2}{x + 2} > 0 \quad \Rightarrow \quad \dfrac{x+1}{x+2} > 0 \Rightarrow x \in (-\infty, -2) \cup (-1, \infty)$

But $x \ge -3 \Rightarrow x \in [-3, -2) \cup (-1, \infty)$

case-II: I : $x < -3$

$\Rightarrow \dfrac{-3 - x - 2}{x + 2} > 0 \quad \Rightarrow \quad \dfrac{x+5}{x+2} < 0 \quad \Rightarrow -5 < x < -2$

But $x < -3 \Rightarrow x \in (-5, -3)$ $\quad \therefore \quad x \in (-5, -2) \cup (-1, \infty)$.

9. **Sol.** $(|x| - 3) (|x| - 5) < 0$

Let $|x| = t \Rightarrow (t - 3) (t - 5) < 0$

$\Rightarrow 3 < t < 5 \Rightarrow 3 < |x| < 5$

$\Rightarrow x \in (-5,-3) \cup (3,5)$

10. **Sol.** $(|x - 1| - 3) (|x + 2| - 5) < 0$

Case-I **:** $x \le -2$

$(x + 2) (x + 7) < 0 \quad \Rightarrow \quad x \in (-7, -2)$ ....(i)

Case-II I **:** $-2 < x \le 1$

$(x - 3) (-x - 2) < 0 \quad \Rightarrow \quad (x - 3) (x + 2) > 0$

$\Rightarrow \quad x \in (-\infty, -2) \cup (3, \infty)$

No solution

Case-III II : $x > 1$

$(x - 4)(x - 3) < 0$

$x \in (3, 4) \quad ....(ii)$

$x \in (i) \cup (ii) \Rightarrow \quad x \in (-7, -2) \cup (3, 4)$

11. **Sol.** $x^2 - 16 \ge 0$

$\therefore \quad (x - 4)(x + 4) \ge 0 \quad \therefore \quad x \in (-\infty, -4] \cup [4, \infty) \quad ....(1)$

Now $\dfrac{(x^2+2)(\sqrt{x^2-16})}{(x^4+2)(x-3)(x+3)} \le 0$

$x \in (-3, 3) \quad ....(2)$

By (1) and (2) $\quad x \in \{-4, 4\}$

(1) o (2) ls $x \in \{-4, 4\}$

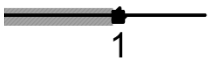
12. $\Rightarrow x \ge 0$ and $x + 5 > 1 + x + 2\sqrt{x}$

$\Rightarrow x \ge 0$ and $x < 4 \Rightarrow x \in [0,4) \Rightarrow a + b = 4$

13. **Sol.** Let $\sqrt{x-1} = t \qquad \sqrt{2t} > 1 - t$

Case-I $\quad t \ge 0$ and $1 - t < 0 \Rightarrow (1, \infty)$

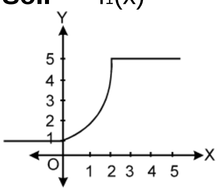
Case-II $\quad t \ge 0$ and $t \le 1 \Rightarrow 2t > 1 + t^2 - 2t \Rightarrow t^2 - 4t + 1 < 0$



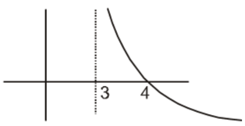
$(2 - \sqrt{3}, 1]$

so finally $x \in (2 - \sqrt{3}, \infty)$

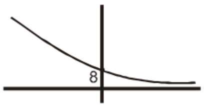
14. **Sol.** $f_1(x) = \begin{cases} 1 & , \quad x \le 0 \\ x^2 + 1 & , \quad 0 < x < 2 \\ 5 & , \quad x \ge 2 \end{cases}$



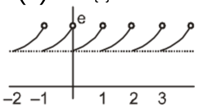
$f_2(x) = \log_{1/2}(x - 3)$



$f_3(x) = 2^{3-x}$



$f_4(x) = e^{\{x\}}$



16. **Sol.** $\sum_{n=1}^{49} f(n) = 0$; $\sum_{n=50}^{149} f(n) = 100$;

f (150) + f(151) = 4 ; $\sum_{n=1}^{151} f(n) = 104$

17. **Sol.** $[x]^2 = -[x]$

$x = I + f$

$I^2 = -I$

$I = 0$ or $I = -1$

Case-I $I = 0$

$x = I + f = f$

$x \in [0, 1)$ ....(i)

Case-II $I = -1$

$-1 \le x < 0, x \in [-1, 0)$ ....(ii)

by (i) and (ii)

$x \in [-1, 1)$

18. **Sol.** (i) $-x^2 + 5x - 6 \ge 0$

(ii) $2\{x\} < 1$ $\Rightarrow$ $x \in \left[2, \frac{5}{2}\right) \cup \{3\}$

PART - II : MISCELLANEOUS QUESTIONS

Section (A) : ASSERTION/REASONING

A-1. **Ans. (1)**

Sol. If a & b are of same sign then $|a + b| = |a| + |b|$ $ab \ge 0$

$\therefore$ $(x - 2)(x - 7) \ge 0$ $\Rightarrow$ $x \le 2$ or $x \ge 7$

$\because$ $2x - 9 = (x - 2) + (x - 7)$

A-2 **Ans.** **(3)**

Sol. $x > 3 \Rightarrow \frac{x-3}{x-3} + 5 > x \Rightarrow 3 < x < 6$

$x < 3 \Rightarrow \frac{-x+3}{x-3} + 5 > x \Rightarrow x < 4$

$\therefore x \in (-\infty, 3) \cup (3, 6)$

Section (B) : MATCH THE COLUMN

1. **Ans+Sol.** (A) → (r), (B) → (p), (C) → (q), (D) → (s)

Fundamental of Mathematics - II

Section (C) : ONE OR MORE THAN ONE OPTIONS CORRECT

1. **Sol.** $|x-2|^{10x^2-1} = |x-2|^{3x}$ $\Rightarrow$ $x-2 = \pm 1$ or $10x^2 - 1 - 3x = 0$ $\Rightarrow$ $x = 1, 3, \frac{1}{2}, -\frac{1}{5}$

2. **Sol.** $y = x + 2|x|$
and $y = 4 + x - |x|$
so, $x + 2|x| = 4 + x - |x|$
$3|x| = 4$
$x = \pm \frac{4}{3}$

(i) When $x = \frac{4}{3}$ then $y = 4$ (ii) When $x = -\frac{4}{3}$ then $y = \frac{4}{3}$

3. **Sol.** $-\infty < x < -2$ $\Rightarrow$ $f(x) = 3$
$-2 \le x < 1$ $f(x) = |2x + 1|$
$1 \le x < \infty$ $f(x) = 3$