Engineering Daily 24 [Home Practice] EV

Real Numbers and Inequalities + Linear Programming

Total Marks: 50 **Negative Marks:** 0.25 **Time:** 1 Hour

MCQ 50 marks

1. What is the value of $\sqrt{11+6\sqrt{2}}+\sqrt{11-6\sqrt{2}}$?

(A) 22 (B) $2\sqrt{2}$ (C) $3\sqrt{2}$ (D) 6

2. If $S=\{x\in\mathbb{R}: x^2-6x+8<0\}\cup\{7\}$, which statement is correct?

(A) $\sup S=7$ but $\max S$ does not exist

(B) $\max S=7$, $\inf S=2$ but $\min S$ does not exist

(C) $\sup S=4$, $\inf S=2$

(D) $\max S=7$, $\min S=2$

3. Which statement about $S=\left\{\frac{3n-1}{n}: n\in\mathbb{N}\right\}$ is correct?

(A) $\max S=3$, $\inf S=2\notin S$

(B) $\min S=2$, $\sup S=3\notin S$

(C) $\max S=3$, $\min S=2$

(D) $\sup S=\infty$

4. What is the solution of the inequality $|4x-3|\geq 9$?

(A) $x\geq 3$ (B) $-\frac{3}{2}\leq x\leq 3$

(C) $x\leq -3$ or $x\geq\frac{3}{2}$ (D) $x\leq -\frac{3}{2}$ or $x\geq 3$

5. What is the solution of the inequality $\frac{1}{|x-2|}<3$?

(A) $x<\frac{5}{3}$ or $x>\frac{7}{3}$ (B) $x\neq 2$

(C) $\frac{5}{3}<x<\frac{7}{3}$ (D) $x>\frac{7}{3}$

6. What is the solution set of the inequality $||3x-1|-4|<2$?

(A) $\left(-\frac{1}{3},1\right)$ (B) $\left(-\frac{5}{3},-\frac{1}{3}\right)\cup\left(1,\frac{7}{3}\right)$

(C) $\left(-\frac{7}{3},-1\right)\cup\left(\frac{1}{3},\frac{5}{3}\right)$ (D) $\left(-\frac{5}{3},\frac{7}{3}\right)$

7. How many integers x satisfy the inequality $|x+2|+|x-5|\leq 11$?

(A) 12 (B) 13 (C) 11 (D) 10

8. If the equation $|x-2|+|x-7|=k$ has infinitely many real solutions, what is the value of k?

(A) $k\geq 5$ (B) $k>5$ (C) $k=9$ (D) $k=5$

9. What is the solution of the inequality $\left|\frac{2x-1}{x+2}\right|<3$?

(A) $x<-7$ or $x>-1$ (B) $-7<x<-1$

(C) $x<-7$ (D) $x>-1$

10. What is the solution set of the equation $|x-2|+|x+3|=5$?

(A) $\{-3,2\}$ (B) $[-3,2]$ (C) $\varnothing$ (D) $\{0\}$

11. How many integers x satisfy the inequality $|2x-3|<11$?

(A) 11 (B) 9 (C) 8 (D) 10

12. What is the solution of the inequality $x^2-3x-10>0$?

(A) $x<-5$ or $x>2$ (B) $x<-2$ or $x>5$

(C) $-2<x<5$ (D) $x>5$

13. If $|x-4|<0.02$, which of the following must be true?

(A) $|x^2-16|<0.10$ (B) $|x^2-16|<0.02$

(C) $|x^2-16|<0.1604$ (D) $|x^2-16|<0.16$

14. If $x\in[-3,2]$, what is the range of x^2+4x?

(A) $[-3,12]$ (B) $[-4,12]$ (C) $[0,12]$ (D) $[-4,4]$

15. What is the solution of the inequality $(x-1)(x+2)^2(x-4)^3\leq 0$?

(A) $\{-2\}\cup[1,4]$ (B) $[-2,4]$

(C) $(-\infty,-2]\cup[1,4]$ (D) $[1,4]$

16. What is the solution of the inequality $\frac{x^2-2x-8}{x+1}\geq 0$?

(A) $(-\infty,-2]\cup(-1,4]$ (B) $[-2,-1)\cup[4,\infty)$

(C) $[-2,-1]\cup[4,\infty)$ (D) $[4,\infty)$

17. What is the solution of the inequality $\frac{2x}{x^2-25}\leq\frac{1}{x+5}$?

(A) $(-\infty,-5)\cup(5,\infty)$ (B) $(-\infty,-5)\cup(-5,5)$

(C) $(-\infty,5)$ (D) $(-5,5)$

18. What is the solution set of the inequality $x^2-8|x|+15\leq 0$?

(A) $(-5,-3)\cup(3,5)$ (B) $[-5,5]$

(C) $[-5,-3]\cup[3,5]$ (D) $[3,5]$

19. What is the solution of the inequality $|x^2-3|\geq 2$?

(A) $1\leq|x|\leq\sqrt{5}$ (B) $|x|\leq 1$

(C) $|x|\leq 1$ or $|x|\geq\sqrt{5}$ (D) $|x|\geq\sqrt{5}$

20. What is the solution of the inequality $\sqrt{x+10}<x-2$?

(A) $x>6$ (B) $x>2$

(C) $x<-1$ or $x>6$ (D) $[-10,-1)$

21. What is the solution of the inequality $\sqrt{x^2-9}>x-2$?

(A) $(-\infty,-3]\cup[3,\infty)$ (B) $\left(\frac{13}{4},\infty\right)$

(C) $\left(3,\frac{13}{4}\right)$ (D) $(-\infty,-3]\cup\left(\frac{13}{4},\infty\right)$

22. For which values of m is $(m-1)x^2+2(m-1)x+3>0$ true for all real x?

(A) $m>1$ (B) $1<m<4$

(C) $1\leq m\leq 4$ (D) $1\leq m<4$

23. If $x>0$, what is the minimum value of $x+\frac{108}{x^2}$?

(A) 6 (B) 18 (C) 9 (D) 12

24. For which values of a does the inequality $x^2 - ax + 9 < 0$ have no real solution?

Ⓐ $-6 \le a \le 6$ Ⓑ $|a| > 6$

Ⓒ $0 \le a \le 6$ Ⓓ $-6 < a < 6$

25. If $a, b > 0$ and $ab = 25$, what is the minimum value of $4a + 9b$?

Ⓐ 50 Ⓑ 90 Ⓒ 30 Ⓓ 60

26. If $x, y > 0$ and $\frac{3}{x} + \frac{4}{y} = 1$, what is the minimum value of $x + y$?

Ⓐ 14 Ⓑ 7 Ⓒ $7 + 4\sqrt{3}$ Ⓓ $4\sqrt{3}$

27. If $|x| < 3$, which of the following is always true?

Ⓐ $|x^2 - 2x + 3| < 12$ Ⓑ $|x^2 - 2x + 3| < 18$

Ⓒ $|x^2 - 2x + 3| < 9$ Ⓓ $|x^2 - 2x + 3| < 6$

28. What is the area, in square units, of the region formed by $x \ge 0$, $y \ge 0$, $5x + 2y \le 20$?

Ⓐ 40 Ⓑ 10 Ⓒ 20 Ⓓ 30

29. What is the area, in square units, of the region bounded by $x + y \ge 5$, $x + y \le 9$, $x \ge 0$, $y \ge 0$?

Ⓐ 32 Ⓑ $\frac{81}{2}$ Ⓒ 14 Ⓓ 28

30. What is the area, in square units, of the region formed by $2 \le |x| + |y| \le 5$?

Ⓐ 21 Ⓑ 42 Ⓒ 34 Ⓓ 50

31. What is the area, in square units, of the region bounded by $|x - 1| \le y \le 5 - |x - 1|$?

Ⓐ 5 Ⓑ 25 Ⓒ $\frac{25}{4}$ Ⓓ $\frac{25}{2}$

32. How many points with integer coordinates lie in the region $x \ge 2$, $y \ge 1$, $x + y \le 8$?

Ⓐ 21 Ⓑ 28 Ⓒ 15 Ⓓ 36

33. The corner points of a feasible region are $(1, 3), (4, 1), (6, 4), (3, 6)$. What is the minimum value of $z = x + 3y$?

Ⓐ 18 Ⓑ 10 Ⓒ 7 Ⓓ 21

34. Subject to $x + y \le 7$, $2x + y \le 10$, $x, y \ge 0$, what is the maximum value of $z = 3x + 2y$?

Ⓐ 17 Ⓑ 14 Ⓒ 21 Ⓓ 15

35. A factory makes two types of bags, A and B. Each A needs 2 hours of sewing and 3 hours of finishing, and each B needs 3 hours of sewing and 2 hours of finishing. At most 24 hours of sewing and 26 hours of finishing are available. If the profit is 50 taka per A and 40 taka per B, what is the maximum profit in taka?

Ⓐ 430 Ⓑ 320 Ⓒ 480 Ⓓ 460

36. Subject to $x + y \le 8$, $3x + y \le 18$, $x, y \ge 0$, the maximum of $z = 3x + ky$ is attained only at $(5, 3)$ (uniquely). What is the range of k?

Ⓐ $\frac{1}{2} < k < 3$ Ⓑ $k > 1$ Ⓒ $1 \le k \le 3$ Ⓓ $1 < k < 3$

37. Subject to $x + y \le 7$, $2x + y \le 11$, $x, y \ge 0$, the maximum of $z = 4x + py$ is attained at every point of the segment joining $(4, 3)$ and $(0, 7)$. What is the value of p?

Ⓐ 4 Ⓑ 2 Ⓒ 7 Ⓓ 1

38. Subject to $x - y \le 2$, $x + y \le 8$, $x, y \ge 0$, what is the maximum value of $z = 3x - y$?

Ⓐ 24 Ⓑ 6 Ⓒ 12 Ⓓ 16

39. Subject to $x + y \ge 6$, $x \le 4$, $y \le 3$, $x, y \ge 0$, what is the minimum value of $z = x + 2y$?

Ⓐ 8 Ⓑ 10 Ⓒ 6 Ⓓ 9

40. Subject to $x + y \le 300$, $3x + y \le 540$, $x, y \ge 0$, what is the maximum value of $z = 4x + 3y$?

Ⓐ 900 Ⓑ 720 Ⓒ 1020 Ⓓ 1200

41. Subject to $x + 2y \ge 10$, $2x + y \ge 11$, $x, y \ge 0$, what is the minimum value of $z = 4x + 3y$?

Ⓐ 25 Ⓑ 40 Ⓒ 33 Ⓓ 36

42. Subject to $4x + 3y \le 24$, $2x + 5y \le 20$, $x, y \ge 0$, what is the maximum value of $z = 3x + 5y$?

Ⓐ 18 Ⓑ 24 Ⓒ $\frac{170}{7}$ Ⓓ 20

43. A farmer has 12 acres of land. Crop A needs 3 workers per acre and crop B needs 1 worker per acre, and at most 24 workers are available. If the profit is 4000 taka per acre of A and 2500 taka per acre of B, what is the maximum profit in taka?

Ⓐ 39000 Ⓑ 30000 Ⓒ 40000 Ⓓ 32000

44. Each unit of food P gives 3 units of protein and 1 unit of fat, and each unit of food Q gives 1 unit of protein and 2 units of fat. At least 10 units of protein and 10 units of fat are required. If P and Q cost 20 and 30 taka per unit respectively, what is the minimum cost in taka?

Ⓐ 180 Ⓑ 200 Ⓒ 300 Ⓓ 160

45. How many points with integer coordinates lie in the region $y \ge 0$, $y \le x$, $x + y \le 6$ (boundary included)?

Ⓐ 14 Ⓑ 18 Ⓒ 16 Ⓓ 12

46. Which of the following points lies in the region $x + y \ge 5$, $3x - y \le 6$, $y \le 5$?

Ⓐ $(5, 1)$ Ⓑ $(3, 4)$ Ⓒ $(1, 3)$ Ⓓ $(2, 7)$

47. Subject to $0 \le x \le 5$, $0 \le y \le 4$, what is the maximum value of $z = 3x + 2y$?

Ⓐ 19 Ⓑ 15 Ⓒ 23 Ⓓ 27

48. What is the common solution of $|x - 2| \le 3$ and $|x - 6| \le 2$?

Ⓐ $[4, 5]$ Ⓑ $[-1, 8]$ Ⓒ $(4, 5)$ Ⓓ $\varnothing$

49. What is the solution of the inequality $\frac{4}{x} < x$?

Ⓐ $|x| > 2$ Ⓑ $(-2, 0) \cup (2, \infty)$

Ⓒ $(-\infty, -2) \cup (0, 2)$ Ⓓ $x > 2$

50. How many integers x satisfy the inequality $\frac{(x^2-4)(x-6)}{x+1} \leq 0$?

Ⓐ **4** Ⓑ **6** Ⓒ **7** Ⓓ **5**