Engineering Daily 24 [Set 04] EV

Real Numbers and Inequalities + Linear Programming

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

MCQ 50 marks

1. How many integers x satisfy the inequality $|x-1|+|x+3|<8$?

Ⓐ 8 Ⓑ 9 Ⓒ 7 Ⓓ 6

2. Which statement about the set $S=\left\{\frac{2}{n}-\frac{3}{m}: m,n\in\mathbb{N}\right\}$ is correct?

Ⓐ $\sup S=2,\ \inf S=-3$; but max, min do not exist

Ⓑ $\sup S=2,\ \inf S=-3$; and max, min exist

Ⓒ $\sup S=2,\ \inf S=0$; but max, min do not exist

Ⓓ $\sup S=1,\ \inf S=-\frac{3}{2}$; but max, min do not exist

3. If $S=\{x\in\mathbb{R}:|3x+1|<8\}$, what are $\sup S$ and $\inf S$ respectively?

Ⓐ $\frac{8}{3},\ -3$ Ⓑ $3,\ -\frac{7}{3}$

Ⓒ $\frac{7}{3},\ -3$ Ⓓ $\frac{7}{3},\ 3$

4. What is the solution set of the inequality $|5-3x|\le 10$?

Ⓐ $\left(-\frac{5}{3},5\right)$ Ⓑ $\left[\frac{5}{3},5\right]$

Ⓒ $\left[-\frac{5}{3},5\right]$ Ⓓ $\left[-5,\frac{5}{3}\right]$

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

Ⓐ $\frac{5}{9}\le x\le\frac{7}{9}$ Ⓑ $\frac{5}{9}\le x\le\frac{7}{9},\ x\neq\frac{2}{3}$

Ⓒ $x\le\frac{5}{9}$ or $x\ge\frac{7}{9}$ Ⓓ $\frac{5}{9}<x<\frac{7}{9}$

6. What is the solution set of the inequality $||x-2|-4|\le 2$?

Ⓐ $[0,4]$ Ⓑ $[-4,8]$

Ⓒ $[-4,0]\cup[4,8]$ Ⓓ $(-4,0)\cup(4,8)$

7. What is the solution of the inequality $|x|+|x-3|+|x+3|<10$?

Ⓐ $(-5,5)$ Ⓑ $\left[-\frac{10}{3},\frac{10}{3}\right]$

Ⓒ $(-3,3)$ Ⓓ $\left(-\frac{10}{3},\frac{10}{3}\right)$

8. For which values of a do the inequalities $|x-a|<3$ and $|x-2|<1$ have at least one common solution?

Ⓐ $-2\le a\le 6$ Ⓑ $1<a<3$

Ⓒ $-2<a<6$ Ⓓ $0<a<4$

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

Ⓐ $-2<x\le -1$ Ⓑ $-5\le x\le -1$

Ⓒ $-5\le x\le -1,\ x\neq -2$ Ⓓ $x\le -5$ or $x\ge -1$

10. What is the solution set of the equation $|x^2-9|+|x-3|=|x^2+x-12|$?

Ⓐ $[3,\infty)$ Ⓑ $[-3,3]$

Ⓒ $(-\infty,-3]$ Ⓓ $[-3,\infty)$

11. What is the common solution of $|x-1|<5$ and $|x+2|>1$?

Ⓐ $(-1,6)$ Ⓑ $(-4,6)$

Ⓒ $(-3,-1)$ Ⓓ $(-4,-3)\cup(-1,6)$

12. What is the solution of the inequality $|x-3|<|x+7|$?

Ⓐ $x<-2$ Ⓑ $x>-2$ Ⓒ $x>3$ Ⓓ $-7<x<3$

13. What is the minimum value of $f(x)=|x-1|+|x-8|$, and on which interval is it attained?

Ⓐ 7; $1\le x\le 8$ Ⓑ 7; only $x=\frac{9}{2}$

Ⓒ 0; $x=1$ Ⓓ 9; $x=0$

14. If $|x-2|<0.4$ and $|y+1|<0.3$, which of the following must be true?

Ⓐ $|3x-2y-8|<1.2$ Ⓑ $|3x-2y-8|<0.9$

Ⓒ $|3x-2y-8|<0.6$ Ⓓ $|3x-2y-8|<1.8$

15. If $x\in(-1,3)$, what is the range of $\frac{1}{x+2}$?

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

Ⓒ $(1,5)$ Ⓓ $\left(\frac{1}{5},1\right)$

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

Ⓐ $[0,21]$ Ⓑ $[-4,21]$

Ⓒ $[-4,5]$ Ⓓ $[5,21]$

17. What is the solution of the inequality $(x+2)(x-1)^2(x-3)<0$?

Ⓐ $(-2,3)$ Ⓑ $(1,3)$

Ⓒ $(-\infty,-2)\cup(3,\infty)$ Ⓓ $(-2,1)\cup(1,3)$

18. What is the solution of the inequality $\frac{(x-2)^3(x+1)}{(x-4)^2}\ge 0$?

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

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

19. What is the solution of the inequality $\frac{3x-2}{x-1}\le 2$?

Ⓐ $x<1$ Ⓑ $0<x<1$

Ⓒ $x\le 0$ or $x>1$ Ⓓ $0\le x<1$

20. What is the solution of the inequality $\frac{x^2-7x+10}{x^2+x+2}<0$?

Ⓐ $2<x<5$ Ⓑ $x<2$ or $x>5$ Ⓒ $[2,5]$ Ⓓ $\varnothing$

21. What is the solution of the inequality $\frac{x+5}{x-2}>0$?

Ⓐ $-5<x<2$ Ⓑ $x<-5$ or $x>2$

Ⓒ $x>2$ Ⓓ $x\le -5$ or $x\ge 2$

22. If $x^2+3x-10<0$ and $x>-1$, what is the solution set of x?

Ⓐ $(-1,2)$ Ⓑ $(-1,5)$ Ⓒ $(-5,2)$ Ⓓ $(2,\infty)$

23. How many integers x satisfy the inequality $x^2 - 6|x| + 5 \le 0$?

Ⓐ 5 Ⓑ 8 Ⓒ 10 Ⓓ 11

24. How many integers x satisfy the inequality $(x^2 - 1)(x^2 - 36) < 0$?

Ⓐ 10 Ⓑ 6 Ⓒ 8 Ⓓ 4

25. What is the solution set of the equation $|x^2 - 6x + 8| + x^2 - 6x + 8 = 0$?

Ⓐ $[2, 4]$ Ⓑ $\{2, 4\}$

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

26. What is the solution of the inequality $\sqrt{x+5} > x + 3$?

Ⓐ $(-4, -1)$ Ⓑ $[-3, -1)$

Ⓒ $[-5, -3)$ Ⓓ $[-5, -1)$

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

Ⓐ $\left[-\frac{3}{\sqrt{2}}, \frac{3}{\sqrt{2}}\right]$ Ⓑ $[-3, 3]$

Ⓒ $\left[-3, \frac{3}{\sqrt{2}}\right]$ Ⓓ $\left[0, \frac{3}{\sqrt{2}}\right]$

28. For which values of k is $kx^2 - 4x + k < 0$ true for all real x?

Ⓐ $k > 2$ Ⓑ $-2 < k < 0$

Ⓒ $k < -2$ Ⓓ $k \le -2$

29. For which values of a is $x^2 - 2(a+1)x + (a+13) > 0$ true for all real x?

Ⓐ $-3 < a < 4$ Ⓑ $-4 < a < 3$

Ⓒ $-4 \le a \le 3$ Ⓓ $a > 3$

30. If $x, y > 0$ and $x + y = 1$, what is the minimum value of $\frac{4}{x} + \frac{9}{y}$?

Ⓐ 36 Ⓑ 13 Ⓒ 20 Ⓓ 25

31. If $x > 0$, what is the minimum value of $\frac{x^2+5x+16}{x}$?

Ⓐ 16 Ⓑ 13 Ⓒ 8 Ⓓ 21

32. If $a, b, c > 0$ and $a + b + c = 12$, what is the maximum value of abc?

Ⓐ 48 Ⓑ 64 Ⓒ 72 Ⓓ 27

33. What is the area, in square units, of the region formed by $x \ge 0$, $y \ge 0$, $3x + 5y \le 30$?

Ⓐ 30 Ⓑ 15 Ⓒ 60 Ⓓ 45

34. What is the area, in square units, of the region bounded by $x + y \le 9$, $y \le 2x$, $y \ge 0$?

Ⓐ 27 Ⓑ 36 Ⓒ 18 Ⓓ 54

35. What is the area, in square units, of the region bounded by $|x - y| \le 3$ and $|x + y| \le 4$?

Ⓐ 14 Ⓑ 48 Ⓒ 12 Ⓓ 24

36. What is the area, in square units, of the region bounded by $|x| \le y \le 6 - |x|$?

Ⓐ 36 Ⓑ 18 Ⓒ 12 Ⓓ 9

37. How many points with integer coordinates lie in the region $3x + 4y \le 24$, $x \ge 0$, $y \ge 0$ (boundary included)?

Ⓐ 33 Ⓑ 36 Ⓒ 30 Ⓓ 35

38. What is the maximum value of $z = 2x - y$ over the region $|x - 2| + |y| \le 3$?

Ⓐ 8 Ⓑ 7 Ⓒ 12 Ⓓ 10

39. The corner points of a feasible region are $(2, 1), (6, 2), (5, 5), (1, 4)$. What is the minimum value of $z = x - 2y$?

Ⓐ -7 Ⓑ -5 Ⓒ 0 Ⓓ 2

40. Subject to $x + 2y \le 12$, $x + y \le 8$, $x, y \ge 0$, what is the maximum value of $z = 2x + 3y$?

Ⓐ 20 Ⓑ 16 Ⓒ 22 Ⓓ 18

41. Subject to $x + y \ge 6$, $3x + y \ge 10$, $x, y \ge 0$, what is the minimum value of $z = 2x + 3y$?

Ⓐ 18 Ⓑ 12 Ⓒ 30 Ⓓ 16

42. A factory makes two products A and B. Each unit of A needs 3 hours in the cutting section and 2 hours in the finishing section, and each unit of B needs 1 hour in cutting and 2 hours in finishing. The cutting and finishing sections can work at most 15 and 14 hours respectively. If the profit is 30 taka per A and 20 taka per B, what is the maximum profit in taka?

Ⓐ 210 Ⓑ 180 Ⓒ 150 Ⓓ 140

43. Subject to $x + y \le 8$, $x + 3y \le 18$, $x, y \ge 0$, the maximum of $z = ax + y$ occurs at $(3, 5)$. What is the range of a?

Ⓐ $1 \le a \le 3$ Ⓑ $\frac{1}{2} \le a \le 2$

Ⓒ $a \ge \frac{1}{3}$ Ⓓ $\frac{1}{3} \le a \le 1$

44. Subject to $x + y \le 9$, $2x + y \le 14$, $x, y \ge 0$, the maximum of $z = 4x + ky$ is attained at every point of the segment joining $(5, 4)$ and $(7, 0)$. What is the value of k?

Ⓐ 8 Ⓑ 4 Ⓒ 2 Ⓓ 1

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

Ⓐ 6 Ⓑ 10 Ⓒ 8 Ⓓ 14

46. For $z = 2x + 3y$ subject to $x - y \le 3$, $x + y \ge 5$, $x, y \ge 0$, which statement is correct?

Ⓐ $z_{min} = 11$; no finite z_{max}

Ⓑ There is no feasible region

Ⓒ $z_{min} = 10$; $z_{max} = 15$

Ⓓ $z_{min} = 15$; no finite z_{max}

47. For maximising $z = x + y$ subject to $x + y \leq 4$, $3x + y \geq 14$, $x, y \geq 0$, which statement is correct?

Ⓐ **The maximum value is 12**

Ⓑ **No feasible solution exists**

Ⓒ **The maximum value is 4**

Ⓓ **The objective function is unbounded**

48. Subject to $3x + 2y \leq 14$, $x + 3y \leq 12$, $x, y \geq 0$, what is the maximum value of $z = 2x + 3y$?

Ⓐ **14** Ⓑ **12** Ⓒ $\frac{102}{7}$ Ⓓ $\frac{28}{3}$

49. A nutritionist mixes two foods X and Y. Each kg of X contains 3 units of iron and 2 units of vitamins, and each kg of Y contains 1 unit of iron and 4 units of vitamins. The mixture needs at least 15 units of iron and 20 units of vitamins. If X and Y cost 35 and 20 taka per kg respectively, what is the minimum cost in taka?

Ⓐ **200** Ⓑ **250** Ⓒ **300** Ⓓ **350**

50. Subject to $x + y \leq 60$, $2x + y \leq 80$, $x, y \geq 0$, what is the maximum value of $z = 5x + 3y$?

Ⓐ **220** Ⓑ **240** Ⓒ **180** Ⓓ **200**