1. If a matrix $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ satisfies $A^6 = kA$, then the value of k is

(1) 6 (2) 32

(3) 1 (4) $\frac{1}{32}$

2. If $A = \begin{bmatrix} k & 2 \\ 2 & k \end{bmatrix}$ and $|A^3| = 125$, then the value of k is

(1) -4 (2) ± 2

(3) ± 3 (4) -5

3. If A is a square matrix satisfying the equation $A^2 - 5A + 7I = 0$, where I is the identity matrix and 0 is null matrix of same order, then $A^{-1} =$

(1) $\frac{1}{5}(7I - A)$ (2) $\frac{1}{7}(5I - A)$

(3) $\frac{1}{7}(A - 5I)$ (4) $7(5I - A)$

4. If A is a square matrix of order 3×3, $\det A = 3$, then the value of $\det(3A^{-1})$ is

(1) 9 (2) $\frac{1}{3}$

(3) 3 (4) 27

5. If $B = \begin{bmatrix} 1 & 3 \\ 1 & \alpha \end{bmatrix}$ be the adjoint of a matrix A and $|A| = 2$, then the value of α is

(1) 3 (2) 4

(3) 5 (4) 2

6. The system of equations $4x + 6y = 5$ and $8x + 12y = 10$ has

(1) Only two solutions (2) No solution

(3) Infinitely many solutions (4) A unique solution

SPACE FOR ROUGH WORK

7. If $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$, $\vec{b} = \hat{i} - \hat{j} + 4\hat{k}$ and $\vec{c} = \hat{i} + \hat{j} + \hat{k}$ are such that $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{c}$, then the value of λ is

(1) 0

(2) 1

(3) ± 1

(4) -1

8. If $|\vec{a}| = 10$, $|\vec{b}| = 2$ and $\vec{a} \cdot \vec{b} = 12$, then the value of $|\vec{a} \times \vec{b}|$ is

(1) 16

(2) 5

(3) 10

(4) 14

9. Consider the following statements:

Statement (I) : If either $|\vec{a}| = 0$ or $|\vec{b}| = 0$, then $\vec{a} \cdot \vec{b} = 0$.

Statement (II) : If $\vec{a} \times \vec{b} = \vec{0}$, then $\vec{a}$ is perpendicular to $\vec{b}$.

Which of the following is correct?

(1) Both Statement (I) and Statement (II) are false

(2) Statement (I) is true but Statement (II) is false

(3) Statement (I) is false but Statement (II) is true

(4) Both Statement (I) and Statement (II) are true

10. If a line makes angles 90°, 60° and θ with x, y and z axes respectively, where θ is acute, then the value of θ is

(1) $\frac{\pi}{2}$

(2) $\frac{\pi}{6}$

(3) $\frac{\pi}{4}$

(4) $\frac{\pi}{3}$

11. The equation of the line through the point (0, 1, 2) and perpendicular to the line $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{-2}$ is

(1) $\frac{x}{3} = \frac{y-1}{-4} = \frac{z-2}{3}$

(2) $\frac{x}{3} = \frac{y-1}{4} = \frac{z-2}{-3}$

(3) $\frac{x}{-3} = \frac{y-1}{4} = \frac{z-2}{3}$

(4) $\frac{x}{3} = \frac{y-1}{4} = \frac{z-2}{3}$

SPACE FOR ROUGH WORK

12. A line passes through $(-1, -3)$ and perpendicular to $x + 6y = 5$. Its x intercept is

(1) 2
(2) $\frac{1}{2}$
(3) $-\frac{1}{2}$
(4) -2

13. The length of the latus rectum of $x^2 + 3y^2 = 12$ is

(1) 24 units
(2) $\frac{2}{3}$ units
(3) $\frac{1}{3}$ units
(4) $\frac{4}{\sqrt{3}}$ units

14. $\lim_{x \to 1} \frac{x^4 - \sqrt{x}}{\sqrt{x} - 1}$ is

(1) $\frac{1}{2}$
(2) 0
(3) 7
(4) does not exist

15. If $y = \frac{\cos x}{1 + \sin x}$, then

(a) $\frac{dy}{dx} = \frac{-1}{1 + \sin x}$
(b) $\frac{dy}{dx} = \frac{1}{1 - \sin x}$
(c) $\frac{dy}{dx} = -\frac{1}{2}\sec^2\left(\frac{\pi}{4} - \frac{x}{2}\right)$
(d) $\frac{dy}{dx} = \frac{1}{2}\sec^2\left(\frac{\pi}{4} - \frac{x}{2}\right)$

(1) Both b and d are correct
(2) Only b is correct
(3) Only a is correct
(4) Both a and c are correct

SPACE FOR ROUGH WORK

16. **Match the following:**

In the following, $[x]$ denotes the greatest integer less than or equal to x.

	Column-I		Column-II
(a)	$x\,\lvert x\rvert$	(i)	continuous in (–1, 1)
(b)	$\sqrt{\lvert x \rvert}$	(ii)	differentiable in (–1, 1)
(c)	$x + [x]$	(iii)	strictly increasing in (–1, 1)
(d)	$\lvert x - 1 \rvert + \lvert x + 1 \rvert$	(iv)	not differentiable at, at least one point in (–1, 1)

(1) a – iii, b – ii, c – iv, d – i

(2) a – i, b – ii, c – iv, d – iii

(3) a – iv, b – iii, c – i, d – ii

(4) a – ii, b – iv, c – iii, d – i

17. The function $f(x) = \begin{cases} e^x + ax & , \quad x < 0 \\ b(x-1)^2 & , \quad x \geq 0 \end{cases}$ is differentiable at x = 0. Then

(1) a = 3, b = –1

(2) a = 1, b = 1

(3) a = 3, b = 1

(4) a = – 3, b = 1

18. A function

$$f(x) = \begin{cases} \dfrac{e^{\frac{1}{x}} - 1}{e^{\frac{1}{x}} + 1} & , \quad \text{if } x \neq 0 \\ 0 & , \quad \text{if } x = 0 \end{cases}, \text{ is}$$

(1) differentiable at x = 0, but not continuous at x = 0

(2) continuous at x = 0

(3) not continuous at x = 0

(4) differentiable at x = 0

SPACE FOR ROUGH WORK

19. If $y = a \sin^3 t$, $x = a \cos^3 t$, then $\frac{dy}{dx}$ at $t = \frac{3\pi}{4}$ is

(1) 1 (2) -1

(3) $\frac{1}{\sqrt{3}}$ (4) $-\sqrt{3}$

20. The derivative of sin x with respect to log x is

(1) $\frac{\cos x}{x}$ (2) $\cos x$

(3) $x \cos x$ (4) $\frac{\cos x}{\log x}$

21. The minimum value of $1 - \sin x$ is

(1) 2 (2) 0

(3) -1 (4) 1

22. The function $f(x) = \tan x - x$

(1) neither increases nor decreases

(2) always increases

(3) always decreases

(4) never increases

23. The value of $\int \frac{dx}{(x+1)(x+2)}$ is

(1) $\log\left|\frac{x+1}{x+2}\right| + c$ (2) $\log\left|\frac{x-1}{x+2}\right| + c$

(3) $\log\left|\frac{x-1}{x-2}\right| + c$ (4) $\log\left|\frac{x+2}{x+1}\right| + c$

24. The value of $\int_{-1}^{1} \sin^5 x \cos^4 x \, dx$ is

(1) 0 (2) $-\pi/2$

(3) π (4) $\pi/2$

SPACE FOR ROUGH WORK

25. The value of $\int_0^{2\pi} \sqrt{1+\sin\left(\frac{x}{2}\right)}\,dx$ is

(1) 0

(2) 8

(3) 4

(4) 2

26. $\int \frac{dx}{x^2(x^4+1)^{3/4}}$ equals

(1) $-\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}}+c$

(2) $\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}}+c$

(3) $(x^4+1)^{\frac{1}{4}}+c$

(4) $-(x^4+1)^{\frac{1}{4}}+c$

27. $\int_0^1 \log\left(\frac{1}{x}-1\right)dx$ is

(1) $\log_e\left(\frac{1}{2}\right)$

(2) 1

(3) 0

(4) $\log_e 2$

28. The area bounded by the curve $y=\sin\left(\frac{x}{3}\right)$, x axis, the lines $x=0$ and $x=3\pi$ is

(1) 3 sq. units

(2) 9 sq. units

(3) $\frac{1}{3}$ sq. units

(4) 6 sq. units

29. The area of the region bounded by the curve $y=x^2$ and the line $y=16$ is

(1) $\frac{128}{3}$ sq. units

(2) $\frac{32}{3}$ sq. units

(3) $\frac{256}{3}$ sq. units

(4) $\frac{64}{3}$ sq. units

SPACE FOR ROUGH WORK

30. General solution of the differential equation $\frac{dy}{dx} + y \tan x = \sec x$ is

(1) $x \sec x = \tan y + c$

(2) $y \sec x = \tan x + c$

(3) $y \tan x = \sec x + c$

(4) $\operatorname{cosec} x = y \tan x + c$

31. If 'a' and 'b' are the order and degree respectively of the differentiable equation

$\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^3 + x^4 = 0$, then $a - b =$ ______

(1) 0

(2) 1

(3) 2

(4) -1

32. The distance of the point $P(-3, 4, 5)$ from yz plane is

(1) 3 units

(2) 4 units

(3) 5 units

(4) -3 units

33. If $A = \{x: x \text{ is an integer and } x^2 - 9 = 0\}$

$B = \{x: x \text{ is a natural number and } 2 \le x < 5\}$

$C = \{x: x \text{ is a prime number} \le 4\}$

Then $(B - C) \cup A$ is,

(1) $\{2, 3, 5\}$

(2) $\{-3, 3, 4\}$

(3) $\{2, 3, 4\}$

(4) $\{3, 4, 5\}$

34. A and B are two sets having 3 and 6 elements respectively.

Consider the following statements.

Statement (I): Minimum number of elements in $A \cup B$ is 3

Statement (II): Maximum number of elements in $A \cap B$ is 3

Which of the following is correct?

(1) Both statements (I) and (II) are false

(2) Statement (I) is true, statement (II) is false

(3) Statement (I) is false, statement (II) is true

(4) Both statements (I) and (II) are true

SPACE FOR ROUGH WORK

35. **Domain of the function f, given by $f(x) = \dfrac{1}{\sqrt{(x-2)(x-5)}}$ is**

(1) $(-\infty, 3] \cup (5, \infty)$ (2) $(-\infty, 2] \cup [5, \infty)$

(3) $(-\infty, 2) \cup (5, \infty)$ (4) $(-\infty, 3) \cup [5, \infty)$

36. **If $f(x) = \sin[\pi^2]x - \sin[-\pi^2]x$, where $[x]$ = greatest integer $\leq x$, then which of the follo not true?**

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

(3) $f\left(\dfrac{\pi}{2}\right) = 1$ (4) $f\left(\dfrac{\pi}{4}\right) = 1 + \dfrac{1}{\sqrt{2}}$

37. **Which of the following is not correct?**

(1) $\tan 45^\circ = \tan(-315^\circ)$ (2) $\cos 5\pi = \cos 4\pi$

(3) $\sin 2\pi = \sin(-2\pi)$ (4) $\sin 4\pi = \sin 6\pi$

38. **If $\cos x + \cos^2 x = 1$, then the value of $\sin^2 x + \sin^4 x$ is**

(1) 2 (2) -1

(3) 1 (4) 0

39. **The mean deviation about the mean for the data 4, 7, 8, 9, 10, 12, 13, 17 is**

(1) 4.03 (2) 10

(3) 3 (4) 8.5

40. **A random experiment has five outcomes w_1, w_2, w_3, w_4 and w_5. The probabilities of the occur of the outcomes w_1, w_2, w_4 and w_5 are respectively $\dfrac{1}{6}$, a, b and $\dfrac{1}{12}$ such that 12a + 12b − Then the probabilities of occurrence of the outcome w_3 is**

(1) $\dfrac{1}{12}$ (2) $\dfrac{2}{3}$

(3) $\dfrac{1}{3}$ (4) $\dfrac{1}{6}$

SPACE FOR ROUGH WORK

41. A die has two faces each with number '1', three faces each with number '2' and one face with number '3'. If the die is rolled once, then P(1 or 3) is

(1) $\frac{1}{6}$ (2) $\frac{2}{3}$

(3) $\frac{1}{2}$ (4) $\frac{1}{3}$

42. Let A = {a, b, c}, then the number of equivalence relations on A containing (b, c) is

(1) 4 (2) 1

(3) 3 (4) 2

43. Let the functions "f" and "g" be f: $\left[0, \frac{\pi}{2}\right] \to \mathbf{R}$ given by $f(x) = \sin x$ and g: $\left[0, \frac{\pi}{2}\right] \to \mathbf{R}$ given by $g(x) = \cos x$, where $\mathbf{R}$ is the set of real numbers

Consider the following statements:

Statement (I): f and g are one-one

Statement (II): f + g is one-one

Which of the following is correct?

(1) Both statements (I) and (II) are false

(2) Statement (I) is true, statement (II) is false

(3) Statement (I) is false, statement (II) is true

(4) Both statements (I) and (II) are true

44. $\sec^2(\tan^{-1} 2) + \operatorname{cosec}^2(\cot^{-1} 3) =$

(1) 10 (2) 1

(3) 5 (4) 15

45. $2\cos^{-1} x = \sin^{-1}\left(2x\sqrt{1-x^2}\right)$ is valid for all values of 'x' satisfying

(1) $\frac{1}{\sqrt{2}} \le x \le 1$ (2) $0 \le x \le \frac{1}{\sqrt{2}}$

(3) $-1 \le x \le 1$ (4) $0 \le x \le 1$

SPACE FOR ROUGH WORK

46. Consider the following statements:

Statement (I): In a LPP, the objective function is always linear.

Statement (II): In a LPP, the linear inequalities on variables are called constraints.

Which of the following is correct?

(1) Statement (I) is false, Statement (II) is true

(2) Statement (I) is true, Statement (II) is true

(3) Statement (I) is true, Statement (II) is false

(4) Both Statements (I) and (II) are false

47. The maximum value of $z = 3x + 4y$, subject to the constraints $x + y \leq 40$, $x + 2y \leq 60$ and $x, y \geq 0$ is

(1) 40

(2) 130

(3) 120

(4) 140

48. Consider the following statements.

Statement (I): If E and F are two independent events, then E' and F' are also independent.

Statement (II): Two mutually exclusive events with non-zero probabilities of occurrence cannot be independent.

Which of the following is correct?

(1) Both the statements are false

(2) Statement (I) is true and statement (II) is false

(3) Statement (I) is false and statement (II) is true

(4) Both the statements are true

49. If A and B are two non-mutually exclusive events such that $P(A|B) = P(B|A)$, then

(1) $P(A) = P(B)$

(2) $A \subset B$ but $A \neq B$

(3) $A = B$

(4) $A \cap B = \phi$

SPACE FOR ROUGH WORK

50. If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, then which of the following is correct?

(1) $P(A) = P(B)$

(2) $P(A|B) = \frac{P(B)}{P(A)}$

(3) $P(A|B) < P(A)$

(4) $P(A|B) \geq P(A)$

51. Meera visits only one of the two temples A and B in her locality. Probability that she visits temple A is $\frac{2}{5}$. If she visits temple A, $\frac{1}{3}$ is the probability that she meets her friend, whereas it is $\frac{2}{7}$ if she visits temple B. Meera met her friend at one of the two temples. The probability that she met her at temple B is

(1) $\frac{9}{16}$

(2) $\frac{7}{16}$

(3) $\frac{5}{16}$

(4) $\frac{3}{16}$

52. If Z_1 and Z_2 are two non-zero complex numbers, then which of the following is not true?

(1) $|Z_1 + Z_2| \geq |Z_1| + |Z_2|$

(2) $\overline{Z_1 + Z_2} = \overline{Z_1} + \overline{Z_2}$

(3) $|Z_1 Z_2| = |Z_1| . |Z_2|$

(4) $\overline{Z_1 Z_2} = \overline{Z_1} . \overline{Z_2}$

SPACE FOR ROUGH WORK

53. Consider the following statements:

Statement(I): The set of all solutions of the linear inequalities $3x + 8 < 17$ and $2x + 8 \geq 12$ are $x < 3$ and $x \geq 2$ respectively.

Statement(II): The common set of solutions of linear inequalities $3x + 8 < 17$ and $2x + 8 \geq 12$ is $(2,3)$

Which of the following is true?

(1) Both the statements are false

(2) Statement (I) is true but statement (II) is false

(3) Statement (I) is false but statement (II) is true

(4) Both the statements are true

54. The number of four digit even number that can be formed using the digits 0, 1, 2 and 3 without repetition is

(1) 12 (2) 6

(3) 10 (4) 4

55. The number of diagonals that can be drawn in an octagon is

(1) 30 (2) 15

(3) 20 (4) 28

56. If the number of terms in the binomial expansion of $(2x + 3)^{3n}$ is 22, then the value of n is

(1) 9 (2) 8

(3) 6 (4) 7

57. If 4^{th}, 10^{th} and 16^{th} terms of a G.P. are x, y and z respectively, then

(1) $y = \frac{x+z}{2}$

(2) $z = \sqrt{xy}$

(3) $y = \sqrt{xz}$

(4) $x = \sqrt{yz}$

SPACE FOR ROUGH WORK

58. If A is a square matrix such that $A^2 = A$, then $(I - A)^3$ is

(1) $-I - A$

(2) $I - A$

(3) $A - I$

(4) $I + A$

59. If A and B are two matrices such that AB is an identity matrix and the order of matrix B is 3×4, then the order of matrix A is

(1) 4×4

(2) 3×4

(3) 3×3

(4) 4×3

60. Which of the following statements is not correct?

(1) A skew symmetric matrix has all diagonal elements equal to zero

(2) A row matrix has only one row

(3) A diagonal matrix has all diagonal elements equal to zero

(4) A symmetric matrix A is a square matrix satisfying $A' = A$.

SPACE FOR ROUGH WORK