12TH CBSE COMLPETE MCQS TESTS

TEST 1

Q1. For which of the given values of x and y, the following pair of matrices are equal?

$$\begin{bmatrix} 3x+7 & 5 \\ y+1 & 2-3x \end{bmatrix}, \begin{bmatrix} 0 & y-2 \\ 8 & 4 \end{bmatrix}$$

(a) $x = \frac{-1}{3}, y = 7$ (b) no such x and y possible (c) $y = 7, x = \frac{-2}{3}$ (d) $x = \frac{-1}{3}, y = \frac{-2}{3}$

Q2. Assume X, Y, Z, W and P are matrices of order $2 \times n, 3 \times k, 2 \times p, n \times 3$ and $p \times k$, respectively. Then the restriction on n, k and p so that $PY + WY$ will be defined are:
(a) $k = 3, p = n$ (b) k is arbitrary, $p = 2$ (c) p is arbitrary, $k = 3$ (d) $k = 2, p = 3$

Q3. The interval in which the function $y=x^2 e^{-x}$ is increasing is:
(a) $(-\infty, \infty)$ (b) $(-2, 0)$ (c) $(2, \infty)$ (d) $(0, 2)$

Q4. A and B are two matrices such that $AB = A$ and $BA = B$ then B^2 is
(a) A (b) B (c) 0 (d) I

Q5. The general solution of the differential equation $\log\left(\frac{dy}{dx}\right) + x = 0$ is
(a) $y = e^{-x} + c$ (b) $y = -e^{-x} + c$ (c) $y = e^{x} + c$ (d) $y = -e^{x} + c$

Q6. If A is a square matrix of order 3 such that $|A| = -5$ then value of $|-AA'|$ is

(a) 125 (b) - 125 (c) 25 (d) – 25

Q7. If A, B are symmetric matrices of same order, then AB – BA is a
(a) Skew symmetric matrix (b) Symmetric matrix (c) Zero matrix (d) Identity matrix

Q8. Two events A and B will be independent, if
(a) A and B are mutually exclusive
(b) $P(A'B') = [1 - P(A)]\,[1 - P(B)]$
(c) $P(A) = P(B)$
(d) $P(A) + P(B) = 1$

Q9. A vector in the direction of vector $\hat{i} - 2\hat{j} + 2\hat{k}$ that has magnitude 15 is
(a) $-5\hat{i} - 10\hat{j} - 10\hat{k}$ (b) $5\hat{i} + 10\hat{j} + 10\hat{k}$ (c) $-5\hat{i} + 10\hat{j} + 10\hat{k}$ (d) $5\hat{i} - 10\hat{j} + 10\hat{k}$

). If $|\vec{a}| = 3, |\vec{b}| = 4$ and $|\vec{a} + \vec{b}| = 5$, then $|\vec{a} - \vec{b}| =$
(A) 3 (B) 4 (C) 5 (D) 8

Q11. The region represented by graph of the inequality $2x + 3y > 6$ is
(a) half plane that contains the origin
(b) half plane that neither contains the origin nor the points on the line $2x + 3y=6$
(c) whole XOY-plane excluding the points on the line $2x + 3y = 6$
(d) entire XOY plane

Q12. $\int e^x \sec x\,(1 + \tan x)\, dx = \cdots$
(a) $e^x \cos x + c$ (b) $e^x \sec x + c$ (c) $e^x \sin x + c$ (d) $e^x \tan x + c$

Q13. $\int_0^{2\pi} \operatorname{cosec}^7 x\, dx =$
(a) 0 (b) 1 (c) 4 (d) 2π

Q14. The number of arbitrary constants in the particular solution of a differential equation of third order is /are
(a) 3 (b) 2 (c) 1 (d) 0

Q15. If $\cos\left[\tan^{-1}\left\{\cot\left(\sin^{-1}\frac{1}{2}\right)\right\}\right] = \cdots$

(a) 1 (b) 0 (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2}$

Q16. The corner points of the feasible region in the graphical representation of a linear programming problem are (2,72), (15,20) and (40,15). If $z = 18x+9y$ be the objective function, then:
(a) z is maximum at (2,72), minimum at (15,20)
(b) z is maximum at (15,20), minimum at (40,15)
(c) z is maximum at (40,15), minimum at (15,20)
(d) z is maximum at (40,15), minimum at (2,72)

Q17. If $x = t^2$, $y= t^3$, then $\frac{d^2y}{dx^2} =$
(a) $\frac{3}{2}$ (b) $\frac{3}{4t}$ (c) $\frac{3}{2t}$ (d) $\frac{3t}{2}$

Q18. The area bounded by the line $y = x$, x-axis and lines $x = -1$ to $x = 2$, is
a) 0 sq. units b) $\frac{1}{2}$ sq units c) $\frac{3}{2}$ sq units d) $\frac{5}{2}$ sq units

ASSERTION – REASON BASED QUESTIONS

Directions: Each of these questions contains two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(c) Assertion is correct, reason is incorrect
(d) Assertion is incorrect, reason is correct.

Q19. Consider the function $f(x)=\begin{cases} x^2 - 5x + 6\ x - 3, & \text{for } x \neq 3 \\ k, & \text{for } x = 3 \end{cases}$ is continuous at x = 3

Assertion (A): The value of k is 4

Reason (R): If f(x) is continuous at a point a then $\lim_{x \to a} f(x) = f(a)$

Q20. Assertion (A) : If $y = tan^{-1}\left(\frac{\cos x + sinx}{\cos x - sinx}\right)$, $-\frac{\pi}{4} < x < \frac{\pi}{4}$ then $\frac{dy}{dx} = 1$

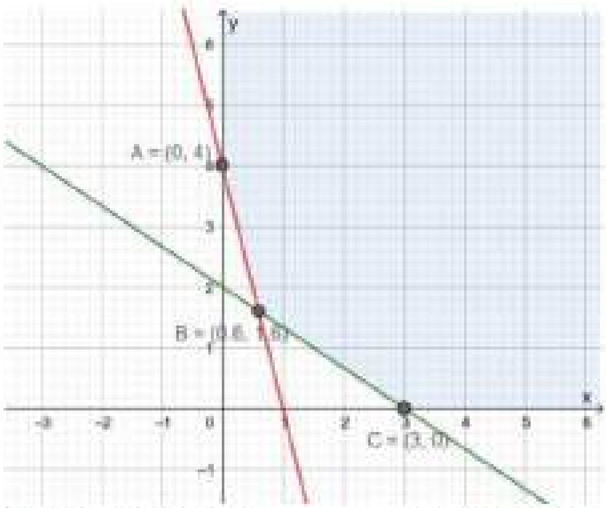
Reason(R) : $\frac{\cos x + sinx}{\cos x - sinx} = \tan\left(x + \frac{\pi}{4}\right)$

TEST 2

1. If $|adj\ A| = 144$, where A is a square matrix of order 3×3 , then $|A| =$
   a)12 b)-12 c)± 12 d)16
2. If $\begin{bmatrix} 5 & 2x+3 \\ 3x-1 & x \end{bmatrix}$ is a symmetric matrix , then value of x is :
   a) 4 b) 3 c) 2 d) 1
3. The interval, in which function $y = x^3 + 6x^2 + 6$ is increasing is :
   a) $(-\infty, -4) \cup (0, \infty)$ b)$(-\infty, 4)$ c) $(-4,0)$
   d) $(-\infty, 0) \cup (4, \infty)$
4. If B is a non singular matrix of order 3 such that $B^2 = 2B$, then the value of $|B| =$
   a) -2 b) 2 c) 4 d) 8
5. The integrating factor of the differential equation $x\frac{dy}{dx} - y = x^2 e^x$ is :
   a) x b) $\frac{1}{x}$ c) $-x$ d) e^{-x}
6. If the points $A(3, -2)$, $B(k, 2)$ and $C(8,8)$ are collinear , then the value of k is :
   a) 2 b) -3 c) 5 d) -4

7. If order of matrix A is 2×3, of matrix B is 3×2 and of matrix C is 3×3, then which one of the following is **not** defined ?
   a) $C(A + B')$ b) $C(A + B')'$ c) BAC d) $CB + A'$
8. If A and B are two events such that $P(A) = 0.2$, $P(B) = 0.4$ and $P(A \cup B) = 0.5$, then the value of $P(A/B)$ is :
   a) 0.1 b) 0.25 c) 0.5 d) 0.08
9. A unit vector perpendicular to the two vectors $\vec{a} = -2\hat{\imath} + 2\hat{\jmath} - 3\hat{k}$ and $\vec{b} = \hat{\imath} - \hat{\jmath} + \hat{k}$ is given by :
   a) $\hat{\imath} - \hat{\jmath}$ b) $\hat{\imath} + \hat{k}$ c) $-\frac{1}{\sqrt{2}}\hat{\imath} - \frac{1}{\sqrt{2}}\hat{\jmath}$ d) $\frac{1}{\sqrt{2}}\hat{\imath} - \frac{1}{\sqrt{2}}\hat{\jmath}$
10. What is the value of $\frac{projection\ of\ \vec{a}\ \text{on}\ \vec{b}}{projection\ of\ \vec{b}\ \text{on}\ \vec{a}}$ for vectors $\vec{a} = 2\hat{\imath} - 3\hat{\jmath} - 6\hat{k}$ and $\vec{b} = 2\hat{\imath} - 2\hat{\jmath} + \hat{k}$
    a) $\frac{3}{7}$ b) $\frac{7}{3}$ c) $\frac{4}{3}$ d) $\frac{4}{7}$
11. The feasible region, for the constraints $x \geq 0$, $y \geq 0$ and $x + y \leq 2$ lies in :
    a) IV quadrant b) III quadrant c) II quadrant d) I quadrant
12. $\int \frac{\cos 2x}{\sin^2 x\cos^2 x} dx$ is equal to :
    a) $cotx + tanx + c$ b) $-cotx + tanx + c$
    c) $cotx - tanx + c$ d) $-cotx - tanx + c$
13. If $f(x)$ is an odd function, then $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} f(x) \cos^3 x\, dx$ equals :
    a) $2\int_0^{\frac{\pi}{2}} f(x) \cos^3 x\, dx$ b) 0
    c) $2\int_0^{\frac{\pi}{2}} f(x)\, dx$ d) $2\int_0^{\frac{\pi}{2}} 2\cos^3 x\, dx$
14. The degree and order of differential equation $y''^2 + \log(y') = x^5$ respectively are :
    a) not defined , 5 b) not defined , 2
    c) 5 , not defined d) 2,2
15. If $y = \cot^{-1} x$, $x < 0$, then
    a) $\frac{\pi}{2} < y \leq \pi$ b) $\frac{\pi}{2} < y < \pi$ c) $-\frac{\pi}{2} < y < 0$ d) $-\frac{\pi}{2} \leq y < 0$

16. The corner points of the shaded unbounded feasible region of an LPP are (0, 4), (0.6, 1.6) and (3, 0) as shown in the figure. The minimum value of the objective function Z = 4x + 6y occurs at



a) (0.6 ,1.6) only b) (3,0) only c) (0.6 , 1.6) and (3,0) only
d) at every point of the line-segment joining the points (0.6, 1.6) and (3, 0)

17. The function $f(x) = [x]$, where $[x]$ is the greatest integer function that is less than or equal to x , is continuous at :
a) 4 b) -2 c) 1.5 d) 1

18. The area (in sq.units) of the region bounded by the curve $y = x, x - axis$, $x = 0$ and $x = 2$ is :
a) $\frac{3}{2}$ b) $\frac{1}{2}\log 2$ c) 2 d) 4

ASSERTION-REASON BASED QUESTIONS

(Question numbers 19 and 20 are Assertion-Reason based questions carrying 1 mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the options (A), (B), (C) and (D) as given below.)

(A) Both (A) and (R) are true and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(C) (A) is true but (R) is false.
(D) (A) is false but (R) is true.

19. ASSERTION (A) : The function $f(x) = |x - 6|cosx$ is differentiable in $R - \{6\}$.
REASON (R) : If a function f is continuous at a point c then it is also differentiable at that point .

20. ASSERTION (A) : $\sec^{-1}\left(\frac{2}{\sqrt{3}}\right) = \frac{\pi}{6}$
REASON (R) : $cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$

TEST 3

Q1. If $A = \begin{bmatrix} 4 & \lambda & -3 \\ 0 & 2 & 5 \\ 1 & 1 & 3 \end{bmatrix}$, and $if\ A^{-1}$ exists, then

(a) $\lambda = 2$ (b) $\lambda \neq 2$ (c) $\lambda = -2$ (d) $\lambda \neq -2$

Q2. If A = $[a_{ij}]$ is a 2 × 3 matrix, such that $a_{ij} = \frac{(-i+2j)^2}{5}$, then a_{23} is

(a)) $\frac{1}{5}$ (b)) $\frac{2}{5}$ (c) $\frac{9}{5}$ (d)) $\frac{16}{5}$

Q3. If A is a square matrix of order 3 and $|A| = 5$, then $|A\ adjA| =$

(a) 125 (b) 25 (c) 625 (d) 5

Q4. If for any square matrix A, A(adjA) = $\begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$ then value of $|A|$

(a) 3 (b) 6 (c) 8 (d) 1

Q5. If $\begin{vmatrix} 3x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 9 & 5 \\ 8 & 3 \end{vmatrix}$, then find x.

(a) 3 (b) 6 (c) ±3 (d) 1

Q6. If the function f(x) = $|x+1| + |x+2|$ is not differentiable at p and q then the value of p + q is

(a) 3 (b) -3 (c) ±3 (d) 0

Q7. The value of k for which the function $(x) = \begin{cases} x\sin\frac{1}{x}, if\ x \neq 0 \\ k-1\ , if\ x = 0 \end{cases}$, is continuous at x = 0

(a) 1 (b) 0 (c) ±1 (d) -1

Q8. If $\int \frac{\sin x}{\sin(x-a)} dx = Ax + B\ log|\sin(x-a)| + C$ then the value of $A^2 + B^2$ is

(a) 2x (b) 0 (c) 1 (d) π

Q9. The direction cosine of a line equally inclined to the axes is?

(a) 1, 1, 1 (b) ±1, ±1,±1 (c) $\pm\frac{1}{\sqrt{3}}, \pm\frac{1}{\sqrt{3}}, \pm\frac{1}{\sqrt{3}}$ (d) 1, 0, 0

Q10. Let A and B be two events. If P (A) = 0.2, P (B) = 0.4, P (A∪B) = 0.6, then P (A|B) is equal to

(a) 0.5 (b) 0.8 (c) 0.3 (d) 0

Q11. If m is the order and n is the degree of given differential equation,

$\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^5 + x^4 = 0$ then what is the value of m + n

(a) 5 (b) 9 (c) 4 (d) 7

Q12. If $\vec{a}$ and $\vec{b}$ be two-unit vectors and θ is the angle between them. Then $\vec{a} + \vec{b}$ is a unit Vector, if $\theta =$

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}$ (d) $\frac{2\pi}{3}$

Q13. If magnitude of vector $x(\hat{\imath} + \hat{\jmath} + \hat{k})$ is '**3 units**' then the value of x is

(a)) $\frac{1}{3}$ (b)) $\sqrt{3}$ (c) $\pm \frac{1}{\sqrt{3}}$ (d)) $\pm \sqrt{3}$

Q14. The projection of $\vec{a} = 2\hat{\imath} - \hat{\jmath} + \hat{k}$ along $\vec{b} = \hat{\imath} + 2\hat{\jmath} + 2\hat{k}$ is

(a) $\frac{2}{3}$ (b) $-\frac{2}{3}$ (c) 2 (d) $\sqrt{6}$

Q15. The direction ratio of the line $\frac{3-2x}{4} = \frac{y+5}{3} = \frac{6-z}{6}$ is

(a) 4, 3, 6 (b) 2, 3, - 6 (c) 2, -3,- 6 (d) – 2, 3, -6

Q16. The objective function Z = 4 x + 3 y can be maximized subjected to the constraints

$3x + 4y \leq 24$, $4x + 3y \leq 24$, $x, y \geq 0$

(a) at only one point (b) does not exist

(c) at two points only (d) at an infinite number of points

Q17.The corner points of feasible solution region determined by the system of linear constraints are (0, 10), (5, 5), (15,15), (0,20). Let $Z = px + qy$, where p, q> 0. Condition on p and q so that the maximum of Z occurs both the point (5,5) and (0,10) is

(a) p = 2q (b) p = q (c) q = 2p (d) q = 3p

Q18. A couple has 2 children. Then probability that both are boys, if it is known that at least one of the children is a boy is?

(a) $\frac{1}{3}$ (b)) $\frac{1}{2}$ (c) $\frac{2}{3}$ (d)) 1

ASSERTION- REASON BASED QUESTIONS

In the following questions a statement of Assertion (A) is followed by a statement of Reason (R).

Choose the correct answer out of the following choices.

(a) Both A and R are true, and R is the correct explanation of A.

(b) Both A and R are true, but R is not the correct explanation of A.

(c) A is true, R is false.

(d) A is false, R is true.

Q19. **Assertion (A)**: $\sin^{-1}(-x) = -\sin^{-1}x\,; x \in [-1,1]$

Reason (R): $\sin^{-1}: [-1,1] \to [\,0,\frac{\pi}{2}]$ is a bijective function.

Q20. **Assertion (A):** $f(x) = \begin{cases} x^2+1 & ,x \le 1 \\ 2x & ,x > 1 \end{cases}$ **is continuous at x=1**

Reason (R): LHL and RHL both are equal and it is equal to f(1).

TEST 4

Q1	If f(x)= $\begin{cases} \frac{x^3-a^3}{x-a} & ,x \ne a \\ b & ,x = b \end{cases}$ is continuous at x =a,then b is equal to (a)a^2 (b) $2a^2$ (c) $3a^2$ (d) 4 a^2
Q2	If y = $Ae^{5x} + Be^{-5x}$, then d^2y/dx^2 = (a)25y (b)5y (c)-25y (d)15y
Q3	The lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{4-z}{k}$ and $\frac{x-1}{k}=\frac{y-4}{2}=\frac{z-5}{-2}$ are mutually perpendicular if the value of k is :

	(a) $\frac{-2}{3}$ (b) $\frac{2}{3}$ (c) -2 (d) 2
Q4	If A is a square matrix of order 3 and $\|A\|$=6, then the value of $\|Adj\ A\|$ is : (a) 6 (b) 36 (c) 27 (d) 216
Q5	If A = $\begin{bmatrix} 0 & a & 5 \\ -2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$ is a skew symmetric matrix, then a+b+c= (a)3 (b) 0 (c) -3 (d) None of these
Q6	The lines $\vec{r} = 0\hat{i} + 0\hat{j} + 0\hat{k} + \lambda(\hat{i} + 2\hat{j} + 3\hat{k})$ and $\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \mu(-2\hat{i} - 4\hat{j} - 6\hat{k})$; (where λ & μ are scalars) are: (a) intersecting (b) parallel (c) skew (d) coincident
Q7	The value of 'n' , such that $x^n\frac{dy}{dx} = y^2(\log y - \log x + 1)$;(where x,y are positive real numbers) is homogeneous: (a)0 (b) 1 (c)2 (d) 3
Q8	If A and B are two events such that P(A/B)=2P(B/A) and P(A) + P(B) = 2/3 , then P(B)= (a)2/9 (b)7/9 (c)4/9 (d)5/9
Q9	If A=$\begin{bmatrix} x & 1 \\ -1 & -x \end{bmatrix}$, such that A^2 =O,then x = (a) 0 (b) +_1 (c) 1 (d) -1
Q10	If $\vec{a}$ is a unit vector and $(\vec{x} - \vec{a})\cdot(\vec{x} + \vec{a}) = 15$ then $\|\vec{x}\|$ is (a) ±4 (b) 4 (c) - 4 (d) $\pm\sqrt{7}$

Q11 A linear programming Problem is as follows:
Minimise Z=2x+y
Subject to constraints
$x \geq 3, x \leq 9, y \geq 0$
$x - y \geq 0, x + y \leq 14$
The feasible region has :
(a)5 corner points including (0,0) and (9,5)
(b)5 corner points including (7,7) and (3,3)
(c)5 corner points including (14,0) and (9,0)
(d)5 corner points including (3,6) and (9,5)

Q12 The sum of the order and degree of differential equation $\frac{d}{dx}[(\frac{dy}{dx})^3]=0$ is:

(a)2 (b)3 (c)5 (d)0

Q13 The value of λ for which the vectors $3\hat{i} - 6\hat{j} + \hat{k}$ and $2\hat{i} - 4\hat{j} + \lambda\hat{k}$ are parallel is:

(a)2/3 (b)3/2 (c)5/2 (d)2/5

Q14 If A is a given square matrix. Then A+ A' is a:

(a)scalar matrix (b) diagonal matrix (c) symmetric matrix (d) null matrix

Q15 If $f(x) = \int_0^x t\sin t \, dt$, then f '(x) is:

(a) cosx + sinx (b) xsinx (c) xcosx (d) sinx + xcosx

Q16 If $|\vec{a} X \vec{b}| = \sqrt{3}$ and $\vec{a} \cdot \vec{b} = -3$, then angle between $\vec{a}$ and $\vec{b}$ is:

(a)$2\pi/3$ (b) $\pi/6$ (c) $\pi/3$ (d) $5\pi/6$

Q17 The area of a triangle with vertices (-3,0),(3,0) and (0,k) is9 square units. The value of k is:

(a) 9 (b)3 (c) -9 (d) 6

Q18 The graph of the inequality 2x+3y>6 is :

(a)Half plain that contains the origin.

(b)Half plane that neither contains the origin nor the points of the line 2x+3y=6.

(c)Whole XOY- plane excluding the points on the line 2x+3y=6.

(d)Entire XOY-plane.

ASSERTION-REASON BASED QUESTIONS

Directions: In the question no. (19) and (20) , a statement of Assertion(A) is followed by a statement of Reason(R). Choose the correct answer out of the following choices:

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true and (R) is not the correct explanation of (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

Q19	Assertion (A): f(x)=tanx-x always increases Reason (R): Any function y=f(x) is increasing if $\frac{dy}{dx}$>0
Q20	ASSERTION (A): The function $f: R \to R$ defined by $f(x) = [x]$ *is neither one – one nor onto.* REASON (R): The function $f: R \to R$ defined f(x) =|x| is onto.

TEST 5

1.	Domain of the function $\sin^{-1}(3x-1)$ is: (a) $[0,1]$ (b) $[-1,1]$ (c) $(-1,1)$ (d) $\left[0,\frac{2}{3}\right]$
2.	If A and B are symmetric matrices of same order , then AB – BA is a : (a) Skew symmetric matrix (b) Symmetric matrix (c) Zero matrix (d) Identity matrix
3.	The number of all possible matrices of order 2 X 3 will each entry 1 or 2 is: (a) 16 (b) 6 (c) 64 (d)24
4.	If the area of a triangle with vertices (-3, 0),(3, 0) and (0, k) is 9 sq. units. Then the value of k will be: (a) 9 (b) 3 (c) -9 (d) 6
5.	If matrix $\begin{bmatrix} 2 & 3 & -1 \\ x+4 & -1 & 2 \\ 3x & 2 & -1 \end{bmatrix}$ is a singular matrix, then the value of x is : (a)$\frac{-3}{16}$ (b)$\frac{3}{16}$ (c) $\frac{4}{13}$ (d)$\frac{8}{10}$
6.	Let f(x) = |x| + |x – 1| then: (a) f(x) is continuous at x=0 as well as at x=1 (b) f(x) is continuous at x=0 as but not at x=1

	(c) f(x) is continuous at x=1 but not at x=0 (d) None of these
7.	The function $f(x) = sinx$ is strictly decreasing in: (a) $\left(\frac{\pi}{2}, \pi\right)$ (b) $(0, 2\pi)$ (c) $\left(0, \frac{\pi}{2}\right)$ (d) $(0, \pi)$
8.	$\int e^{\log \sin x} dx$ is equal to : (a) sinx+C (b) cosx+C (c) –cosx+C (d) –sinx+C
9.	$\int e^{x}(\log \sin x + \cot x)\, dx$ is equal to: (a) $e^x \log sinx + C$ (b) $e^x \cot x + C$ (c) $e^x \tan x + C$ (d) $e^x (\log cosx - \cot x) + C$
10.	The expression for area bounded by the curve $y = f(x)$,the y-axis and between abscissas at $y = c$ and $y = d$ is: (a) $\int_c^d ydx$ (b) $\int_d^c ydx$ (c) $\int_c^d xdy$ (d) $\int_d^c xdy$
11.	The number of arbitrary constants in the general solution of differential equation of fourth order is/ are: (a) 0 (b) 2 (c) 3 (d) 4
12.	Integrating factors of the differential equation, cos x$\frac{dy}{dx}$+ y sin x =1, is (a) sin x (b) sec x (c) tan x (d) cos x
13.	For what value of ‘a’ , the vectors $2\hat{\imath} - 3\hat{\jmath} + 4\hat{k}$ and $a\hat{\imath} + 6\hat{\jmath} - 8\hat{k}$ are collinear: (a) 3 (b) 4 (c) -4 (d) -3
14.	If $\vec{a}= 2\hat{\imath} + \hat{\jmath} + 3\hat{k}$ and $\vec{b}= 3\hat{\imath} + 5\hat{\jmath} - 2\hat{k}$,then $\|\vec{a} \times \vec{b}\|$ is: (a) $\sqrt{507}$ (b) 25 (c) 24 (d) $\sqrt{524}$
15.	If A= $\begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$ and A^2 –xA + yI = O then value of x+y is: (a)10 (b) 23 (c)19 (d)17
16.	Solution set of the inequality 2x+ y > 5 is : (a) The half plane containing origin. (b) The open half plane not containing origin.

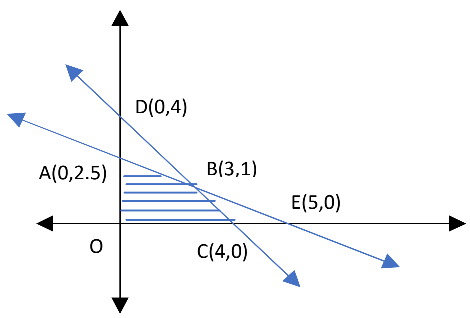
	(c) xy- plane excepts the points on the line 2x + y = 5 (d) None of these
17.	The feasible solution for a LPP is shown in Figure Let z = 3x – 4y be the objective function. Minimum of Z occurs at: (a) (0, 0) (b) (0, 8) (c) (5, 0) (d) (4, 10)
18.	If P(A) = 1/2, P(B) = 0, then P(A|B) is: (a) 0 (b) $\frac{1}{2}$ (c) not defined (d) 1
	ASSERTION-REASON BASED QUESTIONS Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the options (A), (B), (C) and (D) as given below.) (A) Both (A) and (R) are true and (R) is the correct explanation of (A). (B) Both (A) and (R) are true but (R) is not the correct explanation of (A). (C) (A) is true but (R) is false. (D) (A) is false but (R) is true.
19.	Assertion(A): Given set A = $\{1,2,3\}$ and set B = $\{a, b\}$ then number of one-one functions from set A to set B is 6. Reason(R): For a function to be one-one from set A to set B if n(A) $\leq$ n(B).
20.	Assertion(A): The function $f(x) = \begin{cases} \frac{\sin 3x}{x}, x \neq 0 \\ 3, \quad x = 0 \end{cases}$ is continuous at x = 0. Reason(R): A function $f(x)$ is continuous at x = a if $\lim_{x\to a^-} f(x) = \lim_{x\to a^+} f(x) = f(a)$.

TEST 6

1	If $A = [a_{ij}]$ is an identity matrix, then which of the following is true? A. $a_{ij} = \begin{cases} 0, \text{if } i = j \\ 1, \text{if } i \neq j \end{cases}$ B. $a_{ij} = 1, \forall i, j$ C. $a_{ij} = 0, \forall i, j$ D. $a_{ij} = \begin{cases} 0, \text{if } i \neq j \\ 1, \text{if } i = j \end{cases}$
2	If $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 5 \end{bmatrix}$, then $A^{-1}$is : A. $\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{5} \end{bmatrix}$ B. $30\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{5} \end{bmatrix}$ C. $\frac{1}{30}\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 5 \end{bmatrix}$ D. $\frac{1}{30}\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{5} \end{bmatrix}$
3	For any square matrix $A, (A - A^t)^t$ isalways : A. An identity matrix B. A null matrix

	C. A skew symmetric matrix D. A symmetric matrix
4	If $A.(\text{adj } A) = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then the value of $\|A\|.\ \|\text{adj } A\|$ is equal to : A. 12 B. 9 C. 3 D. 27
5	Let, A be the area of a triangle having vertices $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3). Which of the following is correct? A. $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \pm A$ B. $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \pm 2A$ C. $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \pm \frac{A}{2}$ D. $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}^2 = A^2$
6	The value of k for which the function $f(x) = \begin{cases} x^2, x \geq 0 \\ kx, x < 0 \end{cases}$ is differentiable at x =0 is A. 1 B. 2 C. Any real number D. 0
7	If $y = \frac{\cos x - \sin x}{\cos x + \sin x}$, then $\frac{dy}{dx}$ is : A. $-\sec^2\left(\frac{\pi}{4} - x\right)$

	B. $\sec^2\left(\frac{\pi}{4}-x\right)$ C. $\ln\left\|\sec\left(\frac{\pi}{4}-x\right)\right\|$ D. $-\ln\left\|\sec\left(\frac{\pi}{4}-x\right)\right\|$
8	$\int 2^{x+2}dx$ is equal to : A. $2^{x+2}+c$ B. $2^{x+2}\ln 2+c$ C. $\frac{2^{x+2}}{\ln 2}+c$ D. $2.\frac{2^x}{\ln 2}+c$
9	$\int_0^2 \sqrt{4-x^2}\,dx$ equals : A. $2\ln 2$ B. $-2\ln 2$ C. $\frac{\pi}{2}$ D. π
10	What is the product of the order and degree of the differential equation $\frac{d^2y}{dx^2}\sin y+\left(\frac{dy}{dx}\right)^3\cos y=\sqrt{y}$? A. 3 B. 2 C. 6 D. Not defined
11	$x\ln x\frac{dy}{dx}+y=2\ln x$ is an example of a : A. Variable separable differential equation. B. Homogeneous differential equation. C. First order linear differential equation. D. Differential equation whose degree is not defined.

12	Besides non negativity constraints, the figure given below is subject to which of the following constraints  A. $x + 2y \leq 5$; $x + y \leq 4$ B. $x + 2y \geq 5$; $x + y \leq 4$ C. $x + 2y \geq 5$; $x + y \geq 4$ D. $x + 2y \leq 5$; $x + y \geq 4$
13	In $\Delta ABC, \overrightarrow{AB} = \hat{i} + \hat{j} + 2\hat{k}$ and $\overrightarrow{AC} = 3\hat{i} - \hat{j} + 4\hat{k}$. If D is the mid-point of BC, then $\overrightarrow{AD}$ is equal to : A. $4\hat{i} + 6\hat{j}$ B. $2\hat{i} - 2\hat{j} + 2\hat{k}$ C. $\hat{i} - \hat{j} + \hat{k}$ D. $2\hat{i} + 3\hat{k}$
14	If the point $P(a, b, 0)$ lies on the line $\frac{x+1}{2} = \frac{y+2}{3} = \frac{z+3}{4}$, then $(a, b)$is : A. $(1, 2)$ B. $\left(\frac{1}{2}, \frac{2}{3}\right)$ C. $\left(\frac{1}{2}, \frac{1}{4}\right)$ D. $(0, 0)$
15	If α, β and γ are the angles which a line makes with positive directions of x, y and z axes respectively, then which of the following is not true?

	A. $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$ B. $\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 2$ C. $\cos 2\alpha + \cos 2\beta + \cos 2\gamma = -1$ D. $\cos\alpha + \cos\beta + \cos\gamma = 1$
16	The restrictions imposed on decision variables involved in an objective function of a linear programming problem are called : A. Feasible solutions B. Constraints C. Optimal solutions D. Infeasible solutions
17	If $P(A \cap B) = \frac{1}{8}$ and $P(A') = \frac{3}{4}$, then $P\left(\frac{B}{A}\right)$ is equal to : A. $\frac{1}{2}$ B. $\frac{1}{3}$ C. $\frac{1}{6}$ D. $\frac{2}{3}$
18	If A and B are independent events, then which of the following is not true? A. A' and B are independent events. B. A and B' are independent events. C. A' and B' are independent events. D. None of these
	Question number 19 and 20 are Assertion and Reason based question. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R) Select the correct answers from the codes A, B C and D as given below. A. Both A and R are true and R is the correct explanation of A. B. Both A and R are true but R is not the correct explanation of A.

	C. A is true and R is false. D. A is false and R is true.
19	Assertion(A): The relation $R = \{(1,2)\}$ on the set $A = \{1,2,3\}$ is transitive. Reasoning (R): A relation R on a non-empty set A is said to be transitive if $(a, b), (b, c) \in R \Rightarrow (a, c) \in R$, for all $a, b, c \in A$.
20	Assertion(A): The function $f(x) = (x+2)e^{-x}$ is strictly increasing on $(-1, \infty)$. Reasoning (R): A function f(x) is strictly increasing if $f'(x) > 0$.

TEST 7

Q1 The value of $\sin^{-1}\left(\frac{1}{2}\right)+2\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right) is$:

(a) π /2 (b)- π /2 (c) 3π/ 2 (d) None of these

Q2 If the sum of all the elements of a 3 × 3 scalar matrix is 9, then the product of all its elements is:

(a) 0 (b) 9 (c) 27 (d) 729

Q3 If$|A| = |kA|$, where a is a square matrix of order $2 then sum of all possible values of k is$

(a) 0 (b) 1 (c) -1 (d) 2

Q4 If A is a square matrix of order m x n and B is a matrix such that AB^T and B^TA both are defined then order of matrix B is

(a) m x m (b) n x n (c) m x n (d) n x m

Q5 If A and B are square matrices of order 3 such that $|A|$= -1, $|B|$=3, then $|3AB|$is equal to

(a) 9 (b) -9 (c) -81 (d) 81

Q6 Let A = $\begin{bmatrix} 5 & 5k & k \\ 0 & k & 5k \\ 0 & 0 & 5 \end{bmatrix}$ and $|A|^2 = 25$,then value of $|k|$ is

(a) 25 (b) 5 (c) 1 (d) 1/5

Q7 The set of all points where the function $f(x)=x+|x|$ is differentiable, is

(a) $(0, \infty)$ (b) $(-\infty,0)$ (c) $(-\infty,0)\cup(0,\infty)$ (d) $(-\infty,\infty)$

Q8 $\int e^x \sec x(1+\tan x)dx$ is equal to

(a) $e^x\cos x+c$ (b) $e^x\sec x+c$ (c) $e^x\sec x.\tan x+c$ (d) $e^x(1+\tan x)+c$

Q9 The value of $\int_{-1}^{1}|1-x|\,dx$

(a) 3 (b) 2 (c) -2 (d) 1

Q10 Area of the region bounded by the curve $y = cosx$ between $x = 0$ and $x = \pi$ is:

(a) 2 sq. units (b) 4 sq. units (c) 3 sq. units (d) 1 sq. unit

Q11 The difference of the order and degree of the differential equation $d^2y/dx^2 = \cos 3x + \sin 3x$ is

(a) 0 (b) 1 (c) 2 (d) 3

Q12 The integrating factor of diff equation $x\frac{dy}{dx} - y = x^4 - 3x$ is

(a) x (b) 1/x (c) -x (d) log x

Q13 If $|\vec{a}|=2$, $|\vec{b}|=3$ and $\vec{a}.\vec{b} = 2\sqrt{5}$ then find the value of $|\vec{a}\times\vec{b}|$

(a) ± 4 (b) 4 (c) -4 (d) $\sqrt{26}$

Q14 The value of $(\hat{\imath} \times \hat{\jmath}).\hat{k} + (\hat{\jmath} \times \hat{k}).\hat{\imath} + (\hat{\imath} \times \hat{k}).\hat{\jmath}$

(a) 0 (b) 1 (c) 2 (d) 3

Q15 Which of the following is correct

(a) Every LPP admits optimal solution
(b) A LPP admits unique solution.
(c) If a LPP admits two optimal solution ,it has infinite number of solutions.
(d) None of these

Q16 The objective function of a LPP is

(a)Constant
(b) a linear function to be optimized

(c) A linear inequality

(d) A quadratic equation

Q17 If the probability for A to fail in an examination is 0.2 and that for B is 0.3. Then the probability that neither fails.

(a) 0.60 (b) 0.40 (c) 0.56 (d) 0

Q18 If $y = \log_e\left(\frac{x^2}{e^2}\right)$ then $\frac{d^2y}{dx^2}$ equals to

(a) -1/x (b) $-1/x^2$ (c) $2/x^2$ (d) $-2/x^2$

ASSERTION-REASON BASED QUESTIONS

In the following questions 19 and 20 , a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

Q19 Assertion(A): Let A= {2,4,6} , B={3,5,7,9} and defined a function f = { (2,3),(4,5), (6,7)} from A to B ,then f is not onto.

Reason(R): A function f: A→ B is said to be onto, if every element of B is the image of some element of A under f.

Q20 Assertion(A):- If the area of a circle increases at a uniform rate, then its perimeter varies inversely as the radius

Reason(R):-The rate of change of area of a circle with respect to its perimeter is equal to the radius.

TEST 8

1	Q1. Number of symmetric matrices of order 3 x3 with each entry 1 and -1 is (a)256 (b)64 (c)512 (d) 0
2	Let A be a skew symmetric matrix of order 3. If |A|=x, then $(2023)^x$ is a) 2023 b) 1/2023 c) 2023^2 d) 1
3	. If x sin(a+y) = sin y, then dy/dx is equal to a. $[\sin^2(a+y)]/\sin a$ b. $\sin a/[\sin^2(a+y)]$ c. $[\sin(a+y)]/\sin a$ d. $\sin a/[\sin(a+y)]$
4	If A is a square matrix of order 3 and |A| = 5, then the value of |2A′| is (a) -10 (b) 10 (c) -40 (d) 40
5	Find the degree of the differential equation: $(1+\frac{dy}{dx})^3 = (\frac{dy}{dx})^2$ (a). 0 (b)1 (c) 2 (d)3
6	The vector equation for the line passing through the points (–1, 0, 2) and (3, 4, 6) is:(a). i + 2k + λ(4i + 4j + 4k) (b). i – 2k + λ(4i + 4j + 4k) (c) . -i+2k+ λ(4i + 4j + 4k) (d). -i+2k+ λ(4i – 4j – 4k)
7	If A is a square matrix such that $A^2 = A$, then $(I – A)^3 + A$ is equal to

	(a) I (b) 0 (c) I – A (d) I + A
8	. Find P(E|F), where E: no tail appears, F: no head appears, when two coins are tossed in the air. a). 0 (b). ½ (c). 1 (d). None of the above
9.	Two lines with direction ratios a,b,c and p,q, r respectively are said to be …… if ap+bq+ cr =0 (a) parallel (b) Perpendicular (c) Coincident (d) Skew
10	If $\|a \times b\| = 4$ and $\|a.b\| = 2$, then $\|a\|^2 \|b\|^2$ is equal to: (a). 4 (b). 6 (c). 20 (d). 2

11.	The minimum value of Z = 3x + 5y subjected to constraints $x + 3y \geq 3$, $x + y \geq 2$, $x, y \geq 0$ is: (a). 5 (b). 7 (c) . 10 (d). 11
12	If $\int 2^x\, dx = f(x) + C$, then f(x) is a. 2^x b. $2^x \log_e 2$ c. $2^x / \log_e 2$ d. $2^{x+1}/x+1$
13	. If $\int \sec^2(7 - 4x)dx = a \tan(7 - 4x) + C$, then value of a is a. -4 b. -¼ c. 3 d. 7
14	The solution of (x+ logy)dy +ydx =0 where y(0) =1 is (a) y(x−(A)) + ylogy = 0 (b) y(x−1+logy) + 1 = 0 (c) xy+ ylogy +1 = 0 (d) None of these
15	The range of the function $f(x) = \tan^{-1}(x)$ is:

	a) $(-\infty, \infty)$ b) $[0, \pi/2)$ c) $[-\pi/2, \pi/2]$ d) $(-\pi/2, \pi/2)$
16	The optimal value of the objective function is attained at the points: (a) on X-axis (b) on Y-axis (c) corner points of the feasible region (d) none of these
17	Let $f(x) = \|\sin x\|$. Then (a) f is everywhere differentiable (b) f is everywhere continuous but not differentiable at $x = n\pi$, $n \in Z$. (c) f is everywhere continuous but not differentiable at $x = (2n + 1)$, $n \in Z$. (d) none of these
18	. The area of the region bounded by the curve $x^2 = 4y$ and the straight line $x = 4y - 2$ is (a) 3/8 sq. units (b) 5/8 sq. units (c) 7/8 sq. units (d) 9/8 sq. units
	ASSERTION-REASON BASED QUESTIONS (Question numbers 19 and 20 are Assertion-Reason based questions carrying 1

	mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the options (A), (B), (C) and (D) as given below.) In the given question , a statement of Assertion (A) is followed by a statement of reason (R) Choose the correct answer out of the fallowing choice (a) Both A and B are true and R is the correct explanation of A (b) Both A and B are true and R is not the correct explanation of A (c) A is true but R is false (d)A is false but R is true
19	**Assertion (A):** Modulus function is continuous function **REASON (R)**: Modulus function is differentiable function
20	Assertion (A): Let $f:R\rightarrow R$ such that $(x)=x^2$ the function f is an onto function. Reason (R) : A function Let $g:A\rightarrow B$ is said to be onto function if g(A)=B ie.range of g=B

TEST 9

Q1	If f(x)= $\begin{cases} \frac{x^3-a^3}{x-a} & ,x\neq a \\ b & ,x=b \end{cases}$ is continuous at x =a,then b is equal to (a)a^2 (b) $2a^2$ (c) $3a^2$ (d) 4 a^2
Q2	If y = $Ae^{5x} + Be^{-5x}$, then d^2y/dx^2 = (a)25y (b)5y (c)-25y (d)15y
Q3	The lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{4-z}{k}$ and $\frac{x-1}{k}=\frac{y-4}{2}=\frac{z-5}{-2}$ are mutually perpendicular if the value of k is : (a) $\frac{-2}{3}$ (b)$\frac{2}{3}$ (c) -2(d) 2
Q4	If A is a square matrix of order 3 and $\|A\|$=6, then the value of $\|Adj\ A\|$is : (a) 6 (b) 36 (c) 27 (d) 216

Q5	If A $=\begin{bmatrix} 0 & a & 5 \\ -2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$ is a skew symmetric matrix, then a+b+c= (a)3 (b) 0 (c) -3 (d) None of these
Q6	The lines $\vec{r} = 0\hat{i} + 0\hat{j} + 0\hat{k} + \lambda(\hat{i} + 2\hat{j} + 3\hat{k})$ and $\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \mu(-2\hat{i} - 4\hat{j} - 6\hat{k})$; (where λ & μ are scalars) are: (a) intersecting (b) parallel (c) skew (d) coincident
Q7	The value of 'n' , such that $x^n\frac{dy}{dx} = y^2(\log y - \log x + 1)$;(where x,y are positive real numbers) is homogeneous: (a)0 (b) 1 (c)2 (d) 3
Q8	If A and B are two events such that P(A/B)=2P(B/A) and P(A) + P(B) = 2/3 , then P(B)= (a)2/9 (b)7/9 (c)4/9 (d)5/9
Q9	If A=$\begin{bmatrix} x & 1 \\ -1 & -x \end{bmatrix}$, such that A^2 =O,then x = (a) 0 (b) +_ 1 (c) 1 (d) -1
Q10	If $\vec{a}$is a unit vector and ($\vec{x} - \vec{a}$)$\cdot$($\vec{x} + \vec{a}$) = 15 then $\|\vec{x}\|$ is (a) ± 4 (b) 4 (c) - 4 (d) $\pm\sqrt{7}$
Q11	A linear programming Problem is as follows: Minimise Z=2x+y Subject to constraints x≥3,x≤9,y≥0 x-y≥0,x+y≤14 The feasible region has : (a)5 corner points including (0,0) and (9,5) (b)5 corner points including (7,7) and (3,3) (c)5 corner points including (14,0) and (9,0) (d)5 corner points including (3,6) and (9,5)
Q12	The sum of the order and degree of differential equation $\frac{d}{dx}[(\frac{dy}{dx})^3]$=0 is: (a)2 (b)3 (c)5 (d)0
Q13	The value of λ for which the vectors $3\hat{\imath} - 6\hat{\jmath} + \hat{k}$ and $2\hat{\imath} - 4\hat{\jmath} + \lambda\hat{k}$ are parallel is: (a)2/3 (b)3/2 (c)5/2 (d)2/5
Q14	If A is a given square matrix. Then A+ A' is a: (a)scalar matrix (b) diagonal matrix (c) symmetric matrix (d) null matrix
Q15	If f(x) = $\int_0^x t\sin t\, dt$, then f '(x) is:

	(a) cosx + sinx (b) xsinx (c) xcosx (d) sinx + xcosx
Q16	If $\lvert\vec{a}\,\mathrm{X}\vec{b}\rvert = \sqrt{3}$ and $\vec{a}\,.\,\vec{b}$ = -3 , then angle between $\vec{a}$ and $\vec{b}$ is: (a)$2\pi/3$ (b) $\pi/6$ (c) $\pi/3$ (d) $5\pi/6$
Q17	The area of a triangle with vertices (-3,0),(3,0) and (0,k) is9 square units. The value of k is: (a) 9 (b)3 (c) -9 (d) 6
Q18	The graph of the inequality 2x+3y>6 is : (a)Half plain that contains the origin. (b)Half plane that neither contains the origin nor the points of the line 2x+3y=6. (c)Whole XOY- plane excluding the points on the line 2x+3y=6. (d)Entire XOY-plane.

ASSERTION-REASON BASED QUESTIONS

Directions: In the question no. (19) and (20) , a statement of Assertion(A) is followed by a statement of Reason(R). Choose the correct answer out of the following choices:

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true and (R) is not the correct explanation of (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

Q19	Assertion (A): f(x)=tanx-x always increases Reason (R): Any function y=f(x) is increasing if $\frac{dy}{dx}$>0
Q20	ASSERTION (A): The function $f: R \rightarrow R$ defined by $f(x) = [x]$ *is neither one – one nor onto.* REASON (R): The function $f: R \rightarrow R$ defined f(x) =|x| is onto.

TEST 10

1	What is the domain of $cos^{-1}(2x-3)$? a) $[-1,1]$ b) $(1,2)$ c) $(-1,1)$ d) $[1,2]$.
2	If $f(\alpha)=\begin{pmatrix} cos\alpha & sin\alpha \\ -sin\alpha & cos\alpha \end{pmatrix}$ then $f(\alpha)f(\beta)=$ a) $f(\alpha)$ b) $f(\alpha\beta)$ c) $f(\alpha+\beta)$ d) $f(\alpha-\beta)$
3	If $A=\begin{pmatrix} 2 & 3 \\ -1 & 2 \end{pmatrix}$ then $A^2-4A+7I$ is a) null matrix b) an identity matrix c) diagonal matrix d) none of these
4	If $A=\begin{pmatrix} 0 & 2 \\ 3 & -4 \end{pmatrix}$ and If $kA=\begin{pmatrix} 0 & 3a \\ 2b & 24 \end{pmatrix}$, then the values of k, a and b are a) -6, -12, -8 b) -6,-4, -9 c) -6, 4, 9 d) -6, 12, 18
5	If $\|A\|=\|kA\|$ and A is a 2×2 matrix then sum of all possible values of k is a) 1 b) -1 c) 2 d) 0
6	If A is a skew symmetric matrix of order 3×3 and $\|A\|=x$ then $(2025)^x=$ a) $\frac{1}{2025}$ b) 2025 c) $(2025)^2$ d) 1
7	If $y=e^{-x}$ then $\frac{d^2y}{dx^2}=$ a) $-y$ b) y c) x d) $-x$
8	The rate of change of area of a circle with respect to its radius at $r=3cm$ is a) 3π b) 4π c) 6π d) 12π
9	$\int 3^{x+2}dx=$ a) $3^{x+2}+c$ b) $3^{x+2}log3+c$ c) $\frac{3^{x+2}}{log3}+c$ d) $\frac{3^{x+2}}{2log3}+c$
10	$\int_0^{\frac{\pi}{3}} sec^2\left(\frac{\pi}{3}-x\right)dx=$ a) $\frac{1}{\sqrt{3}}$ b) $\sqrt{3}$ c) $-\sqrt{3}$ d) 1
11	The area of the curve $y=sinx$ between 0 and π is a) 1 sq. unit b) 2 sq. unit c) 4 sq. unit d) 8 sq. unit

12	The solution of differential equation $\frac{dy}{dx}+\frac{2y}{x}=0$ is a) $y=\frac{c}{x^2}$ b) $x=\frac{c}{y^2}$ c) $xy=cx$ d) $y=c$
13	The integrating factor of the differential equation $x\frac{dy}{dx}+2y=x^2$ is a) $\frac{1}{x}$ b) x c) x^2 d) $\frac{1}{x^2}$

14. The value of $(\hat{i} \times \hat{j}).\hat{k} + 2.(\hat{j} \times \hat{i}).\hat{k}$ is

a) 1 b) -1 c) 2 d) -2

15. Projection of $2i + j$ on the vector $i - 2j$ is

a) 4 b) 0 c) -4 d) 2

16. The maximum value of $z = 3x + 4y$ subject to constraints $x + y \le 1$ and $x, y \ge 0$ is

a) 7 b) 3 c) 4 d) 10

17. The optimal value of the objective function is attained at the points

a) given by intersection of inequation with y-axis only
b) given by intersection of inequation with x-axis only
c) given by corner points of the feasible region
d) None of these.

18. Two dice are thrown. If it is known that the sum of numbers on the dice was less than 5, the probability of getting a sum 3 is

a) $\frac{1}{6}$ b) $\frac{2}{3}$ c) $\frac{1}{3}$ d) $\frac{5}{6}$

19. The following question contains STATEMENT-1 (Assertion) and STATEMENT-2 (Reason) and has the following choice (a), (b), (c) and (d), only one of which is the correct answer. Mark the correct choice.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

Assertion(A): Principal value of $tan^{-1}(-1) = \frac{\pi}{4}$

Reason(R): $tan^{-1}: R \to (-\frac{\pi}{2}, \frac{\pi}{2})$

20. The following question contains STATEMENT-1 (Assertion) and STATEMENT-2 (Reason) and has the following choice (a), (b), (c) and (d), only one of which is the correct answer. Mark the correct choice.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

Assertion(A) : |sinx| is continuous for all x ∈R

Reason(R) : sinx and |x| are continuous in R .

TEST 11

1. If A is a square matrix of order 3, and $|adj\ A| = 729$, then $|A|$ is equal to

(a) 3 (b) 9 (c) ± 81 (d) None of these

2. Value of $tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ is

(a) $tan^{-1}x$ (b) $2\ tan^{-1}x$ (c) $\frac{1}{2}tan^{-1}x$ (d) None of these

3. If $\begin{bmatrix} 2x+y & 4x \\ 5x-7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y-13 \\ y & x+6 \end{bmatrix}$, then find the value of x and y are

(a) x= 3, y= 1 (b) x = 2, y = 3 (c) x = 2, y = 4 (d) x = 3, y = 3

4. If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$ then the value of x is

(a) 3 (b) $\pm$ 3 (c) $\pm$ 6 (d) 6

5. If there are two values of p for which makes determinant, $\Delta = \begin{vmatrix} 1 & -2 & 5 \\ 2 & p & -1 \\ 0 & 4 & 2p \end{vmatrix} = 86$, then the sum of these number is

(a) 4 (b) 5 (c) -4 (d) 9

6. If A is a square matrix and $A^2 =$ A, then $(I + A)^2 - 3$ A is equal to

(a) I (b) A (c) 2 A (d) 3 I

7. The function f(x) $= \frac{x}{2} + \frac{2}{x}$ has a local minima at x is equal to

(a) 2 (b) 1 (c) 0 (d) -2

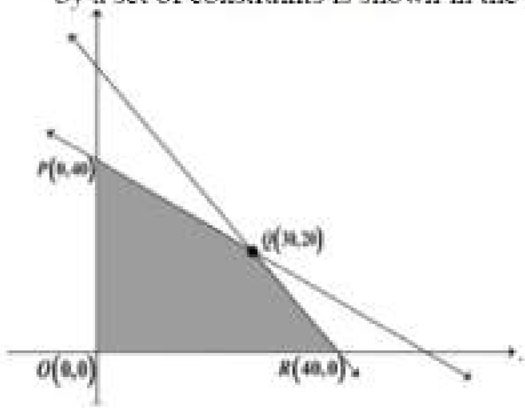
8. $\int \frac{\sqrt{\tan x}}{sinx \cos x}$ dx is equal to

(a) $2\sqrt{\cot x}$ (b) $\frac{\sqrt{\tan x}}{2}$ (c) $\frac{2}{\sqrt{\tan x}}$ (d) $2\sqrt{\tan x}$

9. $\int_0^{\sqrt{5}} [x]dx$ is

(a) $2\sqrt{5}$ (b) $2\sqrt{5}-1$ (c) $2\sqrt{5}-2$ (d) $2\sqrt{5}-3$

10. For the linear programming problem(**LPP**), the objective function is Z= x+y. The feasible region determined by a set of constraints is shown in the graph



Which of the following statements is true?

(a) Maximum value of Z is at P (40,0) (b) Maximum value of Z is at Q(30,20)

(c)Value 0f Z at Q (30,20) is less than value of Z at R (40,0)

(d) Value of Z at R(40,0) is less than value of Z at P(40,0)

11. The solution of differential equation tan y sec ^{2} x + tan x sec ^{2} y = 0 is

(a) tan x + tan y = C (b) tan x – tan y =C (c) tan x . tan y = C (d) $\frac{tan x}{\tan y}$ = C

12. Find the integrating factor of $(1 - x^2)\frac{dy}{dx} - xy = 1$

(a) – x (b) $\frac{x}{1+x^2}$ (c) $\sqrt{1-x^2}$ (d) $\frac{1}{2}\log(1-x^2)$

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

(a) 5 (b) 10 (c) 14 (d) 16

14. If A and B are two events such that P(A) = 0.4, P(B) = 0.8 and P(B/A) =0.6

then P(AUB) is equal to

(a) 0.24 (b) 0.3 (c) 0.48 (d) 0.96

15. The lines $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ and $\frac{x-1}{-2}=\frac{y+3}{-4}=\frac{z-5}{-6}$ are

(a) parallel (b) Intersecting (c) skew (d) coincident

16. If $\vec{a}+\vec{b}+\vec{c}=\vec{0}$, $|\vec{a}|=3$, $|\vec{b}|=5$, $|\vec{c}|=7$ then the angle between $\vec{a}$ and $\vec{b}$ is

(a) $\frac{\pi}{6}$ (b) $\frac{2\pi}{3}$ (c) $\frac{5\pi}{3}$ (d) $\frac{\pi}{3}$

17 .Area of the region bounded by the curve y = cos x between x = 0 and x = π is

(a) 1 sq units (b) 2 sq units (c) 3 sq units (d) 4 sq units

18. If the function $f(x)=\begin{cases}4\times 5^{x} & x<0\\ 8a+x & x\geq 0\end{cases}$ is continuous , then the value of a is

(a) $\frac{1}{2}$ (b) 2 (c) 2 (d) 4

ASSERTION-REASON BASED QUESTIONS

Question numbers 19 and 20 are Assertion-Reason based questions carrying 1 mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the options (A), (B), (C) and (D) as given below.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A)

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(c) (A) is true but (R) is false

(d) (A) is false but (R) is true.

19 . **Assertion** (A): A function f : A →B can not be onto if n(A) < n(B)

Reason (R): A function f is onto if every element of co -domain has at least one pre image in the domain

20.**Assertion** (A) :If f(x) = |cos x|, then f '($\frac{\pi}{4}$) = - $\frac{1}{\sqrt{2}}$ and f ' ($\frac{3\pi}{4}$) = $\frac{1}{\sqrt{2}}$

Reason (R) : f(x) = |cos x|= $\begin{cases} \cos x & x\epsilon\left(0,\frac{\pi}{2}\right) \\ -\cos x & x\epsilon\left(\frac{\pi}{2},\pi\right) \end{cases}$

TEST 12

1. The domain of $\cos^{-1}(3x-2)$is

(A) $\left(\frac{1}{3},2\right)$ (B) $\left[\frac{1}{3},1\right]$ (C) [-1,1] (D) $\left[\frac{-1}{3},\frac{1}{3}\right]$

2. Let $A=\begin{bmatrix} p & q \\ r & s \end{bmatrix}$ be a square matrix such that $adj\ A = A$. Then $(\ p+q+r+s)\ is\ equal\ to$

(A) 2p (B)2q (C) 2r (D) 0

3. If A and B are symmetric matrix of the same order , then $(AB' - BA')$is a

(A) Skew Symmetric matrix (B)Null matrix (C) Symmetric matrix (D)None of these

4. If the area of triangle is 40 sq units with vertices (1,-6), (5,4) and (k,4). then k is

(A) 13 (B) -3 (C) -13,-2 (D) 13,-3

5. Given that A is a square matrix of order 3 and |A|= -2, then | adj(2A)| is equal to

(A) -128 (B) +4 (C) 64 (D)256

6. If $A.(\mathrm{adj}\ A)=\begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then the value of $|A| + |\mathrm{adj}\ A|$ is equal to :

(A)12 (B)9 (C) 3 (D)27

7. The value of k for which the function $f(x) = \begin{cases} x^2, x \geq 0 \\ kx, x < 0 \end{cases}$ is differentiable at $x = 0$ is :

(A)1 (B)2 (C)Any real number (D)0

8. The function f (x) = [x], where [x] denotes the greatest integer function, is continuous at

(A) 4 (B) – 2 (C) 1 (D) 1.5

9. The function $f(x) = tanx - x$

(A) Always increases (B)Always decreases

(C)Never increases (D)Sometimes increases and sometime decreases

10. The anti derivative of $\sqrt{x} + \frac{1}{\sqrt{x}}$ is

(A) $\frac{1}{3}x^{1/3} + 2x^{1/2} + C$ (B) $\frac{2}{3}x^{2/3} + \frac{1}{2}x^2 + C$

(C) $\frac{2}{3}x^{3/2} + 2x^{1/2} + C$ (D) $\frac{3}{2}x^{3/2} + \frac{1}{2}x^{1/2} + C$

11. The area of the region bounded by the lines $y = x, x = 0, x = 3$ and x-axis is:

(A) $\frac{1}{5}$ sq. units (B) $\frac{9}{4}$ sq. units (C) $\frac{9}{2}$ sq. units (D) $\frac{4}{5}$ sq. units

12. The general solution of the differential equation $\log\left(\frac{dy}{dx}\right) = 3x + 4y$ is –

(A) $4e^{3x} + 3e^{-4y} = C$ (B) $e^{3x} + 3e^{-4y} = C$ (C) $3e^{3x} + 4e^{-4y} = C$ (D) $4e^{3x} - 3e^{-4y} = C$

13. The solution of the differential equation $2x\frac{dy}{dx} - y = 3$ represents a family of

(A) Straight lines (B)Circles (C)Parabolas (D)Ellipses

14. If $|\vec{a}| = 8$, $|\vec{b}| = 3$ and $|\vec{a} \times \vec{b}| = 12$ then $\vec{a} . \vec{b}$ is

(A) $6\sqrt{3}$ (B) $8\sqrt{3}$ (C) $12\sqrt{3}$ (D)None of these

15. If a line makes equal acute angles with coordinate axes , then direction cosines of the line is

(A)1,1,1 (B) $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$ (C) $\frac{1}{3}, \frac{1}{3}, \frac{1}{3}$ (D) $\frac{1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}$

16. The corner point of the feasible region determined by the system of linear constraints are (0,10), (5,5), (15,15) and (0,20) . let Z = px+ qy , where p,q >0.

Condition on p and q so that the maximum of z occurs at both the points (15,15) and (0,20) is

(A)p = q (B)p = 2q (C)q = 2p (D)q = 3p

17. Let A and B be two events such that P(A) = 0.6 , P(B) = 0.2 and $P\left(\frac{A}{B}\right) = 0.5$ then $P(\frac{A'}{B'})$ equals

(A)1/10 (B)3/10 (C)3/8 (D)6/7

18. Corner points of the feasible region for an LPP are (0, 2), (3, 0), (6, 0), (6, 8) and (0, 5).

Let F = 4x + 6y be the objective function. The Minimum value of F occurs at

(A) (0, 2) only (B) (3, 0) only (C) the mid point of the line segment joining the points (0, 2) and (3, 0) only (D) any point on the line segment joining the points (0, 2) and (3, 0).

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true

19. **Assertion(A):** $\int_{-2}^{2} log\left(\frac{1+x}{1-x}\right) dx = 0$

Reason(R): If f is an odd function, then $\int_{-a}^{a} f(x)\,dx = 0$

20. **Assertion(A):** Let A= {2,4,6} , B={3,5,7,9} and defined a function f = { (2,3),(4,5), (6,7)} from A to B ,then f is not onto.

Reason(R): A function f: A→B is said to be onto, if every element of B is the image of some element of A under f.

TEST 13

1. $\tan^{-1}\{sin(-\pi/_2)\}$ is equal to

(a) -1 (b) 1 (c) $\pi/_2$ (d) $-\pi/_4$

2. If A is a square matrix such that A^2=A then

$(I + A)^2 - 3A$ is

(a) I (b) 2A (c) 3I (d) A

3. If A and B are matrices of order $3 \times m$ and $3 \times n$ respectively such that $m = n$, then order of 2A+7B is

(a) 3×3 (b) $m \times 3$ (c) $n \times 3$ (d) $3 \times m$

4. If $A = \begin{bmatrix} 0 & a \\ 0 & 0 \end{bmatrix}$ then A^{16} is equal to

(a) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & a^{16} \\ 0 & 0 \end{bmatrix}$ (c) A (d) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

5. If A is a square matrix of order 3x3 such that A. (AdjA) = 10 I then $|(Adj.A)|$ is

(a) 1 (b) 10 (c) 100 (d) 1000

6. If A and B are invertible matrices of the same order. Given $|(AB)^{-1}| = 8$ *and* $|A| = 3/_4$ *then* $|B|$ *is*

(a) 6 (b) $1/_6$ (c) $4/_3$ (d) $-1/_6$

7. Derivative of x^x with respect to x is

(a) $log(1 + x)$ (b) $x.x^{x-1}$ (c) $x^x(1 + logx)$ (d) $x^x log(1 + x)$

8. The total revenue in the ₹ received from the sale of x units of an article is given by R(x)=$3x^2+36x+5$. The marginal revenue when x = 15 is (in ₹)

(a) 126 (b) 116 (c) 96 (d) 90

9. The function f(x)= $cos(2x + \pi/_4), x \in \left[\frac{3\pi}{8}, \frac{5\pi}{8}\right]$

(a) Increasing (b) decreasing (c) neither increasing nor decreasing (d) none of these.

10. $\int_{-1}^{1} |1 - x|\, dx$ is equal to

(a) 1 (b) 2 (c) 3 (d) -3

11. If p and q are the degree and order of the differential equation

$\left(\frac{d^2y}{dx^2}\right)^2 + 3\frac{dy}{dx} + \frac{d^3y}{dx^3} = 4$ then the value of 2p−3q is

(a) 7 (b) −7 (c) 3 (d) −3

12. The value of p for which $\vec{a} = 3\hat{\imath} + 2\hat{\jmath} + 9\hat{k}$ and $\vec{b} = \hat{\imath} + p\hat{\jmath} + 3\hat{k}$ are parallel vectors is

(a) 3 (b) 3/2 (c) 2/3 (d) 1/3

13. A line makes angle α, β, γ, with x-axis, y-axis and z-axis respectively then

$cos2\alpha + cos2\beta + cos2\gamma$ is equal to

(a) 2 (b) 1 (c) − 2 (d) −1

14. Direction ratio of the line $\frac{4-x}{2} = \frac{y}{6} = \frac{1-z}{3}$ are

(a) 2, 6, 3 (b) − 2, 6, 3 (c) 2, − 6, 3 (d) none of these.

15. Vector equation of the line $\frac{x-5}{3} = \frac{y+4}{7} = \frac{6-z}{2}$ is

(a) $\vec{r} = -3\hat{\imath} + 7\hat{\jmath} - 2\hat{k} + \mu(5\hat{\imath} - 4\hat{\jmath} + 6\hat{k})$ (c) $\vec{r} = -5\hat{\imath} + 4\hat{\jmath} - 6\hat{k} + \mu(-3\hat{\imath} - 7\hat{\jmath} - 2\hat{k})$

(b) $\vec{r} = 5\hat{\imath} - 4\hat{\jmath} + 6\hat{k} + \mu(3\hat{\imath} + 7\hat{\jmath} - 2\hat{k})$ (d) $\vec{r} = 3\hat{\imath} + 7\hat{\jmath} + 2\hat{k} + \mu(-5\hat{\imath} + 4\hat{\jmath} - 6\hat{k})$

16. The objective function for a given linear programming problem is Z=ax +by−5. If Z attains same value at (1,2) and (3,1) then.

(a) 2a−b=0 (b) a + 2b = 0 (c) a + b = 0 (d) a = b

17. For a given LPP, corner points of a closed feasible region are A (3,5), B (4,2), C (3,0) and O (0,0), then objective function Z= px + qy attains maximum at

(a) A (b) B (c) C or O (d) It depends upon values of p and q and points A, B, C.

18. If A and B are independent events such that P(B/A) = 2/5 then P(B') is

(a) 1/5 (b) 2/5 (c) 3/5 (d) 4/5

ASSERTION-REASON BASED QUESTIONS

(Question numbers 19 and 20 are Assertion-Reason based questions carrying 1 mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the options (A), (B), (C) and (D) as given below.)

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

19. Assertion (A): In set A = {1, 2, 3} a relation R defined as R = {(1, 1), (2, 2)} is reflexive.

Reason (R): A relation R is reflexive in set A if (a, a)∈ R for all a∈A.

20. Assertion (A): f(x)=[x] is not differentiable at x = 2.

Reason (R): f(x) = [x] is not Continuous at x=2.

TEST 14

1. A function $f : R_+ \to R$ (where R_+ is the set of all non-negative real numbers) defined by $f(x) = 4x + 3$ is :

(A) one-one but not onto

(B) onto but not one-one

(C) both one-one and onto

(D) neither one-one nor onto

2. If a matrix has 36 elements, the number of possible orders it can have, is :

(A) 13 (B) 3

(C) 5 (D) 9

3. Which of the following statements is true for the function $f(x) = \begin{cases} x^2 + 3, & x \neq 0 \\ 1, & x = 0 \end{cases}$?

(A) f(x) is continuous and differentiable $\forall\ x \in \mathbb{R}$

(B) f(x) is continuous $\forall\ x \in \mathbb{R}$

(C) f(x) is continuous and differentiable $\forall\ x \in \mathbb{R} - \{0\}$

(D) f(x) is discontinuous at infinitely many points

4. Let f(x) be a continuous function on [a, b] and differentiable on (a, b). Then, this function f(x) is strictly increasing in (a, b) if

(A) $f'(x) < 0, \forall\ x \in (a, b)$

(B) $f'(x) > 0, \forall\ x \in (a, b)$

(C) $f'(x) = 0, \forall\ x \in (a, b)$

(D) $f(x) > 0, \forall\ x \in (a, b)$

5. If $\begin{bmatrix} x+y & 2 \\ 5 & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$, then the value of $\left(\frac{24}{x} + \frac{24}{y}\right)$ is :

(A) 7 (B) 6

(C) 8 (D) 18

6. $\int_a^b f(x)\, dx$ is equal to :

(A) $\int_a^b f(a-x)\, dx$ (B) $\int_a^b f(a+b-x)\, dx$

(C) $\int_a^b f(x-(a+b))\, dx$ (D) $\int_a^b f((a-x)+(b-x))\, dx$

7. Let θ be the angle between two unit vectors $\hat{a}$ and $\hat{b}$ such that $\sin\theta = \frac{3}{5}$.

Then, $\hat{a} \cdot \hat{b}$ is equal to :

(A) $\pm\frac{3}{5}$ (B) $\pm\frac{3}{4}$

(C) $\pm\frac{4}{5}$ (D) $\pm\frac{4}{3}$

8. The integrating factor of the differential equation $(1 - x^2) \frac{dy}{dx} + xy = ax$, $-1 < x < 1$, is :

(A) $\frac{1}{x^2 - 1}$ (B) $\frac{1}{\sqrt{x^2 - 1}}$

(C) $\frac{1}{1 - x^2}$ (D) $\frac{1}{\sqrt{1 - x^2}}$

9. If the direction cosines of a line are $\sqrt{3}\,k$, $\sqrt{3}\,k$, $\sqrt{3}\,k$, then the value of k is :

(A) ± 1 (B) $\pm \sqrt{3}$

(C) ± 3 (D) $\pm \frac{1}{3}$

10. A linear programming problem deals with the optimization of a/an :

(A) logarithmic function (B) linear function

(C) quadratic function (D) exponential function

11. If $P(A \mid B) = P(A' \mid B)$, then which of the following statements is true ?

(A) $P(A) = P(A')$ (B) $P(A) = 2\,P(B)$

(C) $P(A \cap B) = \frac{1}{2}\,P(B)$ (D) $P(A \cap B) = 2\,P(B)$

12. $\begin{vmatrix} x+1 & x-1 \\ x^2+x+1 & x^2-x+1 \end{vmatrix}$ is equal to :

(A) $2x^3$ (B) 2

(C) 0 (D) $2x^3 - 2$

13. The derivative of $\sin(x^2)$ w.r.t. x, at $x = \sqrt{\pi}$ is :

(A) 1 (B) -1

(C) $-2\sqrt{\pi}$ (D) $2\sqrt{\pi}$

14. The order and degree of the differential equation $\left[1+\left(\frac{dy}{dx}\right)^2\right]^3 = \frac{d^2y}{dx^2}$ respectively are :

(A) 1, 2 (B) 2, 3

(C) 2, 1 (D) 2, 6

15. The vector with terminal point A (2, – 3, 5) and initial point B (3, – 4, 7) is :

(A) $\hat{i} - \hat{j} + 2\hat{k}$ (B) $\hat{i} + \hat{j} + 2\hat{k}$

(C) $-\hat{i} - \hat{j} - 2\hat{k}$ (D) $-\hat{i} + \hat{j} - 2\hat{k}$

16. The distance of point P(a, b, c) from y-axis is :

(A) b (B) b^2

(C) $\sqrt{a^2 + c^2}$ (D) $a^2 + c^2$

17. The number of corner points of the feasible region determined by constraints $x \geq 0, y \geq 0, x + y \geq 4$ is :

(A) 0 (B) 1

(C) 2 (D) 3

18. If A and B are two non-zero square matrices of same order such that $(A + B)^2 = A^2 + B^2$, then :

(A) AB = O (B) AB = – BA

(C) BA = O (D) AB = BA

*Questions number **19** and **20** are Assertion and Reason based questions. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the codes (A), (B), (C) and (D) as given below.*

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is ***not*** the correct explanation of the Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

19. *Assertion (A) :* For matrix $A = \begin{bmatrix} 1 & \cos\theta & 1 \\ -\cos\theta & 1 & \cos\theta \\ -1 & -\cos\theta & 1 \end{bmatrix}$, where $\theta \in [0, 2\pi]$, $|A| \in [2, 4]$.

Reason (R) : $\cos\theta \in [-1, 1], \forall \theta \in [0, 2\pi]$.

20. *Assertion (A) :* A line in space cannot be drawn perpendicular to x, y and z axes simultaneously.

Reason (R) : For any line making angles, α, β, γ with the positive directions of x, y and z axes respectively, $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$.

TEST 15

1. If for a square matrix A, $A^2 - 3A + I = O$ and $A^{-1} = xA + yI$, then the value of $x + y$ is :

(a) -2 (b) 2

(c) 3 (d) -3

2. If $|A| = 2$, where A is a 2×2 matrix, then $|4A^{-1}|$ equals :

(a) 4 (b) 2

(c) 8 (d) $\frac{1}{32}$

3. Let A be a 3×3 matrix such that $|\text{adj } A| = 64$. Then $|A|$ is equal to :

(a) 8 only (b) -8 only

(c) 64 (d) 8 or -8

4. If $A = \begin{bmatrix} 3 & 4 \\ 5 & 2 \end{bmatrix}$ and 2A + B is a null matrix, then B is equal to :

(a) $\begin{bmatrix} 6 & 8 \\ 10 & 4 \end{bmatrix}$ (b) $\begin{bmatrix} -6 & -8 \\ -10 & -4 \end{bmatrix}$

(c) $\begin{bmatrix} 5 & 8 \\ 10 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} -5 & -8 \\ -10 & -3 \end{bmatrix}$

5. If $\frac{d}{dx}(f(x)) = \log x$, then f(x) equals :

(a) $-\frac{1}{x} + C$ (b) $x(\log x - 1) + C$

(c) $x(\log x + x) + C$ (d) $\frac{1}{x} + C$

6. $\int_0^{\frac{\pi}{6}} \sec^2(x - \frac{\pi}{6})\, dx$ is equal to :

(a) $\frac{1}{\sqrt{3}}$ (b) $-\frac{1}{\sqrt{3}}$

(c) $\sqrt{3}$ (d) $-\sqrt{3}$

7. The sum of the order and the degree of the differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^3 = \sin y$ is :

(a) 5 (b) 2

(c) 3 (d) 4

8. The value of p for which the vectors $2\hat{i} + p\hat{j} + \hat{k}$ and $-4\hat{i} - 6\hat{j} + 26\hat{k}$ are perpendicular to each other, is :

(a) 3 (b) -3

(c) $-\frac{17}{3}$ (d) $\frac{17}{3}$

9. The value of $(\hat{i} \times \hat{j}) . \hat{j} + (\hat{j} \times \hat{i}) . \hat{k}$ is :

(a) 2 (b) 0

(c) 1 (d) -1

10. If $\vec{a} + \vec{b} = \hat{i}$ and $\vec{a} = 2\hat{i} - 2\hat{j} + 2\hat{k}$, then $|\vec{b}|$ equals :

(a) $\sqrt{14}$ (b) 3

(c) $\sqrt{12}$ (d) $\sqrt{17}$

11. Direction cosines of the line $\frac{x-1}{2} = \frac{1-y}{3} = \frac{2z-1}{12}$ are :

(a) $\frac{2}{7}, \frac{3}{7}, \frac{6}{7}$ (b) $\frac{2}{\sqrt{157}}, -\frac{3}{\sqrt{157}}, \frac{12}{\sqrt{157}}$

(c) $\frac{2}{7}, -\frac{3}{7}, -\frac{6}{7}$ (d) $\frac{2}{7}, -\frac{3}{7}, \frac{6}{7}$

12. If $P\left(\frac{A}{B}\right) = 0{\cdot}3$, $P(A) = 0{\cdot}4$ and $P(B) = 0{\cdot}8$, then $P\left(\frac{B}{A}\right)$ is equal to :

(a) 0·6 (b) 0·3

(c) 0·06 (d) 0·4

13. The value of k for which $f(x) = \begin{cases} 3x+5, & x \geq 2 \\ kx^2, & x < 2 \end{cases}$ is a continuous function, is :

(a) $-\frac{11}{4}$ (b) $\frac{4}{11}$

(c) 11 (d) $\frac{11}{4}$

14. If $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ and $(3I + 4A)(3I - 4A) = x^2 I$, then the value(s) x is/are :

(a) $\pm\sqrt{7}$ (b) 0

(c) ± 5 (d) 25

15. The general solution of the differential equation $x\,dy - (1 + x^2)\,dx = dx$ is :

(a) $y = 2x + \frac{x^3}{3} + C$ (b) $y = 2\log x + \frac{x^3}{3} + C$

(c) $y = \frac{x^2}{2} + C$ (d) $y = 2\log x + \frac{x^2}{2} + C$

16. If $f(x) = a(x - \cos x)$ is strictly decreasing in $\mathbb{R}$, then 'a' belongs to

(a) $\{0\}$ (b) $(0, \infty)$

(c) $(-\infty, 0)$ (d) $(-\infty, \infty)$

17. The corner points of the feasible region in the graphical representation of a linear programming problem are (2, 72), (15, 20) and (40, 15). If $z = 18x + 9y$ be the objective function, then :

(a) z is maximum at (2, 72), minimum at (15, 20)

(b) z is maximum at (15, 20), minimum at (40, 15)

(c) z is maximum at (40, 15), minimum at (15, 20)

(d) z is maximum at (40, 15), minimum at (2, 72)

18. The number of corner points of the feasible region determined by the constraints $x - y \geq 0$, $2y \leq x + 2$, $x \geq 0$, $y \geq 0$ is :

(a) 2 (b) 3

(c) 4 (d) 5

*Questions number **19** and **20** are Assertion and Reason based questions carrying 1 mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the codes (a), (b), (c) and (d) as given below.*

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is ***not*** the correct explanation of the Assertion (A).

(c) Assertion (A) is true and Reason (R) is false.

(d) Assertion (A) is false and Reason (R) is true.

19. *Assertion (A) :* The range of the function $f(x) = 2 \sin^{-1} x + \frac{3\pi}{2}$, where $x \in [-1, 1]$, is $\left[\frac{\pi}{2}, \frac{5\pi}{2}\right]$.

Reason (R) : The range of the principal value branch of $\sin^{-1}(x)$ is $[0, \pi]$.

20. *Assertion (A) :* Equation of a line passing through the points (1, 2, 3) and (3, – 1, 3) is $\frac{x-3}{2} = \frac{y+1}{3} = \frac{z-3}{0}$.

Reason (R) : Equation of a line passing through points (x_1, y_1, z_1), (x_2, y_2, z_2) is given by $\frac{x-x_1}{x_2-x_1} = \frac{y-y_1}{y_2-y_1} = \frac{z-z_1}{z_2-z_1}$.