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**Q1.** The principal value of $\tan^{-1}\left(\tan\frac{3\pi}{5}\right)$ is: **1 Mark**

**A** $\frac{2\pi}{5}$ **B** $\frac{-2\pi}{5}$ **C** $\frac{3\pi}{5}$ **D** $\frac{-3\pi}{5}$

**Q2.** The value of $\tan^{-1}\left(\tan\frac{7\pi}{6}\right)$ is: **1 Mark**

**A** $\frac{\pi}{6}$ **B** $\frac{\pi}{2}$ **C** $\frac{\pi}{3}$ **D** $\frac{7\pi}{6}$

**Q3.** If A is a square matrix of order 3 and |A| = 5, then the value of |2A'| is: **1 Mark**

**A** -10 **B** 10 **C** -40 **D** 40

**Q4.** The principal value of $\cot^{-1}(-\sqrt{3})$ is **1 Mark**

**A** $-\frac{\pi}{6}$ **B** $\frac{\pi}{6}$ **C** $\frac{2\pi}{3}$ **D** $\frac{5\pi}{6}$

**Q5.** If f and g are two functions from R to R defined as $f(x) = |x| + x$ and $g(x) = |x| - x$, then fog (x) for x<0 is **1 Mark**

**A** 4x **B** 2x **C** 0 **D** -4x

**Q6.** Let A be a 3 × 3 matrix such that |adj A| = 64. Then |A| is equal to: **1 Mark**

**A** 8 only **B** - 8 only **C** 64 **D** 8 or -8

**Q7.** The function f : R→[– 1, 1] defined by $f(x) = \cos x$ is **1 Mark**

**A** Both one-one and onto. **B** Not one-one, but onto.
**C** One-one, but not onto. **D** Neither one-one, nor onto.

**Q8.** If a matrix has 36 elements, the number of possible orders it can have, is: **1 Mark**

**A** 13 **B** 3 **C** 5 **D** 9

**Q9.** The principal value of $\cos^{-1}\left(\cos\frac{13\pi}{6}\right)$ is: **1 Mark**

**A** $\frac{13\pi}{6}$ **B** $\frac{\pi}{2}$ **C** $\frac{\pi}{3}$ **D** $\frac{\pi}{6}$

**Q10.** If |A| = 2, where A is a 2 × 2 matrix, then $|4A^{-1}|$ equals: **1 Mark**

**A** 4 **B** 2 **C** 8 **D** $\frac{1}{32}$

**Q11.** If A is a square matrix such that $A^2 = A$, then $(I - A)^3 + A$ is equal to: **1 Mark**

**A** I **B** 0 **C** I - A **D** I + A

**Q12.** $\tan\left(\sin^{-1}\frac{3}{5} + \tan^{-1}\frac{3}{4}\right)$ is equal to: **1 Mark**

**A** $\frac{7}{24}$ **B** $\frac{24}{7}$ **C** $\frac{3}{2}$ **D** $\frac{3}{4}$

**Q13.** $\begin{bmatrix} x+1 & x-1 \\ x^2+x+1 & x^2-x+1 \end{bmatrix}$ is equal to: **1 Mark**

**A** $2x^3$ **B** 2 **C** 0 **D** $2x^3 - 2$

**Q14.** If A is a non-singular square matrix of order 3 such that $A^2 = 3A$, then value of |A| is: **1 Mark**

**A** –3 **B** 3 **C** 9 **D** 27

**Q15.** If $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ nd (31 + 4A) (3I + 4A) = $x^2$I, then the value(s) x is/ are: **1 Mark**

**A** $\pm\sqrt{7}$ **B** $0$ **C** $\pm 5$ **D** $25$

**Q16.** Let A = {1, 3, 5}. Then the number of equivalence relations in A containing (1, 3) is: **1 Mark**

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**A** 1 **B** 2 **C** 3 **D** 4

**Q17.** The two lines x = ay + b, z = cy + d; and x = a'y + b', z = c'y + d' are perpendicular to each other, if: **1 Mark**

**A** $\frac{a}{a'} + \frac{c}{c'} = 1$ **B** $\frac{a}{a'} + \frac{c}{c'} = -1$

**C** $aa' + cc' = 1$ **D** $aa' + cc' = -1$

**Q18.** If $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ nd (31 + 4A) (3I + 4A) = $x^2$I, then the value(s) x is/ are: **1 Mark**

**A** $\pm\sqrt{7}$ **B** $0$ **C** $\pm 5$ **D** $25$

**Q19** A function $f : R_+ \to R$ (where $R_+$ is the set of all non-negative real numbers) defined by f(x) = 4x + 3 is: **1 Mark**

**A** one-one but not onto **B** onto but not one-one

**C** both one-one and onto **D** neither one-one nor onto

**Q20.** $\tan^1 3 + \tan^{-1}\lambda = \tan^{-1}\left(\frac{3+\lambda}{1-3\lambda}\right)$ is valid for what values of $\lambda$? **1 Mark**

**A** $\lambda \in \left(-\frac{1}{3}, \frac{1}{3}\right)$ **B** $\lambda > \frac{1}{3}$

**C** $\lambda < \frac{1}{3}$ **D** All real values of $\lambda$

**Q21.** If $\cos\left(\sin^{-1}\frac{2}{\sqrt{5}} + \cos^{-1} x\right) = 0$, then x is equal to **1 Mark**

**A** $\frac{1}{\sqrt{5}}$ **B** $-\frac{2}{\sqrt{5}}$ **C** $\frac{2}{\sqrt{5}}$ **D** $1$

**Q22.** $\left(\tan^{-1}\frac{7}{9} + \tan^{-1}\frac{1}{8}\right)$ is equal to **1 Mark**

**A** $\tan^{-1}\left(\frac{65}{72}\right)$ **B** $\tan^{-1}\left(\frac{63}{65}\right)$

**C** $\frac{\pi}{4}$ **D** $\frac{\pi}{2}$

**Q23.** If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then det (adj A) equals: **1 Mark**

**A** $a^{27}$ **B** $a^9$ **C** $a^6$ **D** $a^2$

**Q24** If A is a 3 × 3 matrix and |A| = -2, then value of |A (adj A)| is: **1 Mark**

**A** -2 **B** 2 **C** -8 **D** 8

**Q25.** If $A = \begin{bmatrix} 3 & 4 \\ 5 & 2 \end{bmatrix}$ and 2A + B is a null matrix, then B is equal to: **1 Mark**

**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** $\begin{bmatrix} -5 & -8 \\ -10 & -3 \end{bmatrix}$

**Q26** If A is a square matrix of order 3, such that A (adj A) = 10 I, then |adj A| is equal to: **1 Mark**

**A** 1 **B** 10 **C** 100 **D** 101

**Q27.** The domain of the function $f(x) = \sin^{-1}(2x)$ is **1 Mark**

**A** $[0, 1]$ **B** $[-1, 1]$

**C** $\left[-\frac{1}{2}, \frac{1}{2}\right]$ **D** $[-2, 2]$

**Q28** If A is a skew symmetric matrix of order 3, then the value of |A| is: **1 Mark**

**A** 3 **B** 0 **C** 9 **D** 27

**Q29.** If $\begin{bmatrix} x & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ -2 & 0 \end{bmatrix} = 0$, then x equals: **1 Mark**

**A** 0 **B** -2 **C** -1 **D** 2

**Q30.** The number of corner points of the feasible region determined by the constraints **1 Mark**
$x - y \geq 0, 2y \leq x + 2, x \geq 0, y \geq 0$ is:

**A** 2 **B** 3 **C** 4 **D** 5

**Q31.** **1 Mark**

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If $A = \begin{bmatrix} -2 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -2 \end{bmatrix}$, then the value of |adj A| is

**A** 64 **B** 16 **C** 0 **D** -8

**Q32.** If $\begin{bmatrix} x & 2 \\ 3 & x-1 \end{bmatrix}$ is a singular matrix, then the product of all possible values of x is: **1 Mark**

**A** 6 **B** -6 **C** 0 **D** -7

**Q33.** **1 Mark**

The matrix $\begin{bmatrix} 2 & -1 & 3 \\ \lambda & 0 & 7 \\ -1 & 1 & 4 \end{bmatrix}$ is not invertible for:

**A** $\lambda = -1$ **B** $\lambda = 0$

**C** $\lambda = 1$ **D** $\lambda \in R - (1)$

**Q34.** Let $A = \begin{bmatrix} 200 & 50 \\ 10 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 50 & 40 \\ 2 & 3 \end{bmatrix}$, then $|AB|$ is equal to **1 Mark**

**A** 460 **B** 2000 **C** 3000 **D** -7000

**Q35.** The value of $\tan^{-1}\left[\frac{1}{2}\cos^{-1}\left(\frac{\sqrt{5}}{3}\right)\right]$ is: **1 Mark**

**A** $\frac{3+\sqrt{5}}{2}$ **B** $\frac{3-\sqrt{5}}{2}$

**C** $\frac{-3+\sqrt{5}}{2}$ **D** $\frac{-3-\sqrt{5}}{2}$

**Q36.** If $\begin{bmatrix} 3 & 4 \\ 5 & 2 \end{bmatrix}$ and 2A + B is a null matrix, then B is equal to: **1 Mark**

**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** $\begin{bmatrix} -5 & -8 \\ -10 & -3 \end{bmatrix}$

**Q37** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

**Assertion:** $\cos^{-1} x - \sin^{-1} x = 0$, then $x = \frac{1}{\sqrt{2}}$.

**Reason:** $\cot^{-1} x + \sin^{-1} x = \frac{\pi}{2}$.

**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.

**E** Both A and R are false.

**Q38** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

**Assertion:** The function f : R → R, $f(x) = |x|$ is not one - one.

**Reason:** The function $f(x) = |x|$ is not onto.

**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.

**E** Both A and R are fals.

**Q39** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

If A = {1, 2, 3}, B = {4,5, 6, 7} and f = {(1, 4), (2,5), (3, 6)} is a function from A to B.

**Assertion:** f(x) is a one - one function.

**Reason:** f(x) is an onto function.

**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 and R is true.

**Q40** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

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**Assertion:** If X = {0, 1, 2} and the function defined by f(x) = $x^2$ - 2 is surjection then Y = {-2, -1, 0}.
**Reason:** If f : X → Y is surjective if f(X) = Y.

**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.
**E** Both A and R are fals.

**Q41.** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

**Assertion:** Matrix $\mathrm{A} = \begin{pmatrix} 1 & 2 \\ -2 & 1 \end{pmatrix}$, satisfies the equation x2 - 2x + 5I = 0, then A is invertible.

**Reason:** If a square matrix satisfies the equation $a_nX^n + a_{n-1}X^{n-1} + .... + a_1X + a_nI^z = 0$ and $a_n \neq 0$, Then A is invertible.

**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.
**E** Both A and R are false.

**Q42** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

Consider the set A = {1, 3, 5}.
**Assertion:** The number of reflexive relations on set A is $2^9$.
**Reason:** A relation is said to be reflexive if xRx, $\forall\, \mathrm{x} \in \mathrm{A}$.

**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 and R is true.

**Q43** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

**Assertion:** Inverse of a matrix $\mathrm{A} = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ is the matrix $\mathrm{A}^{-1} = \begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}$.

**Reason:** Inverse of a square matrix $\begin{pmatrix} \mathrm{a} & \mathrm{b} \\ \mathrm{c} & \mathrm{d} \end{pmatrix}$ is $\begin{pmatrix} \mathrm{d} & -\mathrm{b} \\ -\mathrm{c} & \mathrm{a} \end{pmatrix}$.

**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.
**E** Both A and R are false.

**Q44** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

**Assertion:** If $0 < \mathrm{x} \leq \frac{\pi}{2}$, then $\sin^{-1}(\cos \mathrm{x}) + \cos^{-1}(\sin \mathrm{x}) = \pi - 2\mathrm{x}$.
**Reason:** $\cos^{-1} \mathrm{x} = \frac{\pi}{2} - \sin^{-1} \mathrm{x}$ for all $\mathrm{x} \in [-1, 1]$.

**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.
**E** Both A and R are fals.

**Q45** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

**Assertion:** If $\mathrm{A} = \begin{pmatrix} 1 & 2 & -1 \\ 2 & 0 & 3 \\ -1 & 3 & 4 \end{pmatrix}$, then $A^{-1}$ is symmetric matrix.

**Reason:** If A is symmetric matrix then $A^{-1}$ is symmetric matrix.

**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.
**E** Both A and R are false.

**Q46** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

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**Assertion:** If $A = \begin{pmatrix} 0 & -2 & 3 \\ 2 & 0 & 6 \\ -3 & -6 & 0 \end{pmatrix}$, then $A^{-1}$ does not exist.

**Reason:** If A is a skew symmetric matrix of odd order, then A is singular.

**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.
**E** Both A and R are false.

**Q47** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

Let R be the relation in the set of integers Z given by R = {a, b) : 2 divides a - b}.

**Assertion:** R is a reflexive relation.

**Reason:** A relation is said to be reflexive if xRx, $\forall\, x \in Z$.

**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 and R is true.

**Q48** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

**Assertion:** If $x = \frac{1}{5\sqrt{2}}$ then $\{x\cos(\cot^{-1} x) + \sin(\cot^{-1} x)\}^2 = \frac{51}{50}$.

**Reason:** $\tan\left[\cos^{-1}\left(\frac{1}{5\sqrt{2}}\right) - \sin^{-1}\left(\frac{4}{\sqrt{17}}\right)\right] = \frac{29}{3}$.

**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.
**E** Both A and R are fals.

**Q49** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

**Assertion:** A function f : A → B, cannot be an onto function if n(A) < n(B).

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

**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.
**E** Both A and R are fals.

**Q50** **Directions:** In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as: **1 Mark**

**Assertion:** The value of x for which $\begin{bmatrix} 3 & x \\ x & 1 \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix}$ is $\pm 2\sqrt{2}$.

**Reason:** The determinant of a matrix A order 2x2, $A\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is = ad - bc.

**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.
**E** Both A and R are false.

**Q51.** If $A = \begin{bmatrix} -3 & 2 \\ 1 & -1 \end{bmatrix}$ and $I = \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$, Find scalar k so that $A^2 + I = kA$. **2 Marks**

**Q52.** If $A = \begin{bmatrix} -3 & 6 \\ -2 & 4 \end{bmatrix}$ then show that $A^3 = A$. **2 Marks**

**Q53.** Find the matrix A such that $A\begin{bmatrix} 1 & 2 \\ -1 & 0 \end{bmatrix} = \begin{bmatrix} 3 & 4 \\ -1 & 6 \end{bmatrix}$. **2 Marks**

**Q54.** Find $(AB)^{-1}$ if $A = \begin{bmatrix} 1 & 0 \\ -4 & 2 \end{bmatrix}$ and $B^{-1} = \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$. **2 Marks**

**Q55.** **2 Marks**

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If $A = \begin{bmatrix} 3 & 9 & 0 \\ 1 & 8 & -2 \\ 7 & 5 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 0 & 2 \\ 7 & 1 & 4 \\ 2 & 2 & 6 \end{bmatrix}$, then find the matrix B'A'.

**Q56.** Express $A = \begin{bmatrix} 4 & -3 \\ 2 & -1 \end{bmatrix}$ as a sum of a symmetric and a skew symmetric matrix. **2 Marks**

**Q57.** If $A = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$, show that (A - 2I) (A - 3I) = 0. **2 Marks**

**Q58.** Check if the relation R on the set A = {1, 2, 3, 4, 5, 6} defined as R = {(x, y) : y is divisible by x} is (i) symmetric (ii) transitive. **2 Marks**

**Q59.** Express $\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right), -\frac{3\pi}{2} < x < \frac{x}{2}$ in the simplest form. **2 Marks**

**Q60.** Check if the relation R in the set of real numbers defined as R = {(a, b) : a < b} is (i) symmetric, (ii) transitive. **2 Marks**

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