

General Instructions: - All questions are compulsory.

Question 1 to 6 carries one mark each. Question 7 carry two (2) marks.3
Question 8 carry three (3) marks. Question 9 carry five (5)marks. Question
10 carry four (4) marks.

SECTION - A

(1-6) सही उत्तर पर ($\sqrt{}$) का निशान लगाएँ | Mark ($\sqrt{}$) on the correct answer.

1. Let $f: R \rightarrow R$ be defined as $f(x) = 3x$ choose the correct answer:

- (a) f is many – one onto (b) f is one – one onto
(c) f is neither one – one nor onto (d) f is one – one but not onto

2. The value of $\sin^{-1} x$ is

- (a) $-\frac{\pi}{3}$ (b) $-\frac{\pi}{6}$ (c) $-\frac{\pi}{4}$ (d) None of these

3. The principal value of $\tan^{-1}(\tan \frac{2\pi}{3})$

- (a) $\frac{2\pi}{3}$ (b) $-\frac{\pi}{3}$ (c) $\frac{5\pi}{3}$ (d) None of these

4. The cofactor of a_{23} in $\begin{bmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & 7 \end{bmatrix}$

- (a) 13 (b) -13 (c) 12 (d) 17

5. The derivative of $\cos x^4$ w.r.t. x is:

- (a) $-4x^3 \sin x^4$ (b) $4x^3 \sin x^4$ (c) $4x^3 \cos x^4$ (d) $-4x^3 \cos x^4$

6. Assertion (A): A relation $R = \{(a, b); |a - b| < 2\}$ defined on the set $A = \{1, 2, 3, 4, 5\}$ is reflexive.

Reason (R): A relation R on the set A is said to be reflexive if for $(a, b) \in R$ and $(b, c) \in R$, we have $(a, c) \in R$.

- (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion
(B) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion

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

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

SECTION -B

7.If $A = \begin{bmatrix} -2 \\ 4 \\ 5 \end{bmatrix}$ and $B = [1 \ 3 \ -6]$ find $(AB)'$

OR

.If $x=2at^2, y = at^4$, then find $\frac{dy}{dx}$

SECTION -C

8.For what value of λ is the function defined by $f(x) = \begin{cases} \lambda(x^2 - 2x), & \text{if } x \leq 0 \\ 4x + 1, & \text{if } x > 0 \end{cases}$ continuous at $x = 0$?

What about continuity at $x = 1$?

OR

.If Q be the set of all rational numbers, show that the function $f: Q \rightarrow Q$ $f(x) = 3x + 5$, for $\forall x \in Q$ is bijective.

SECTION -D

9. Solve the following equations by a matrix method: $2x + 3y + 3z = 5$

$$x - 2y + z = -4$$

$$3x - y - 2z = 3$$

SECTION -E

10.Sushant wants to prepare hand made gift box for the upcoming Diwali festival. For making the lower part of box he takes a square piece of cardboard of side 20 cm.

Based on the above information, answer the following questions:

- (i) If x cm be the length of each side of square cardboard which is to be cut off from corner of the square piece of side 20 cm, find the interval in which the possible values of x lie?
- (ii) If V is the volume of the box, find an expression for V in terms of x .
- (ii) Find the maximum volume of the box.

OR

Find the value of $\frac{dV}{dx}$ at $x = 5$.

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