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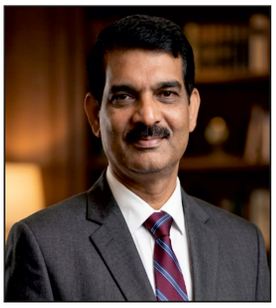
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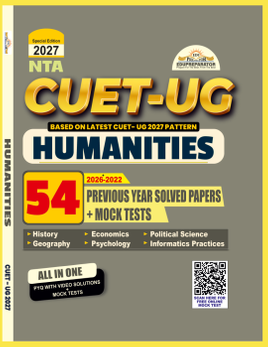
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Mr. Lalan Kumar Pandit is a highly experienced Mathematics educator with over 25 years plus teaching experience. He possesses a strong academic foundation in the subject, supported by years of dedicated teaching experience. Known for his clarity of concepts and systematic approach, he has been instrumental in guiding students for various competitive examinations such as CUET, CBSE, and other entrance tests. With extensive experience in teaching Class 11 & 12 (CBSE) students, Mr. Pandit specialises in building a solid conceptual base in Mathematics while also focusing on problem-solving techniques and speed enhancement. His teaching methodology emphasises logical reasoning, step-by-step solutions, and application-based learning, enabling students to tackle even the most challenging questions with confidence.













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1 RELATION AND FUNCTION

Main Concepts

1) A relation R in a set A is called

(i) reflexive, if (a,a) ∈ R, for every a ∈ A.

(ii) symmetric, if $(a_1, a_2) \in R$ implies that $(a_2, a_1) \in$R for all $a_1, a_2 \in A$

(iii) transitive, if $(a_1, a_2) \in R$ and $(a_2, a_3) \in R$ implies that $(a_1, a_3) \in R$

for all $a_1, a_2, a_3 \in A$.

2) A relation R in a set A is said to be equivalence relation if R is reflexive, symmetric and transitive.

3) Types of functions:

1. A function $f: X \to Y$ is defined to be one-one (or injective) if the images of distinct elements of X under f are distinct,
2. A function f:X → Y is said to be onto (or surjective), if every element of Y is the image of some element of X under f, i.e. for every y ∈ Y there exists an element x ∈ X such that
f (x)=y.
3. A function f:X ⟶ Y is said to be one-one and onto (or bijective), if f is both one-one and onto.

4) Invertible function:

1. A function f:X → Y is defined to be invertible if there exists a function g:Y → X such that g ∘ $f = I_X$ and $f \circ g = I_Y$. The function g is called the inverse of f and is denoted by f^{-1}.
2. A function f:X to Y is invertible, if and only if f is a bijective function.
3. If $f: X \to Y, g: Y \to Z$ and $h: Z \to S$ are functions, then $h \circ (g \circ f) = (h \circ g) \circ f$.

Let f:X → Y and g:Y → Z be two invertible functions, then $g \circ f$ is also invertible with $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$.

5) Binary operations

1) A binary operation '*' on a set A is a function *: A A → A.
We denote *(a,b) by a * b.
2) A binary operation '*' on the set X is called commutative if a * b = b * a for every a,b ∈ X.
3) A binary operation * : A A → A is said to be associative if (a * b) * c = a * (b * c), for every a,b,c ∈ A.
4) Given a binary operation * : A A → A, an element e ∈ A, if it exists, is called identity for the operation * if a * e = a = e * a, for all a ∈ A.
5) Given a binary operation * : A A → A, with the identity element e in A, an element a ∈ A is said to be invertible with respect to the operation '*', if there exists an element b in A

such that a * b = e = b * a and b is called the inverse of a and is denoted by a^{-1}. If n(A)=P, n(B)=Q, ∴ n(A×B)= P×Q

⇒Total number of relations = 2^n where n = P × Q,

6) Number of reflexive relations on a set containing n elements is 2^{n^2-n}

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ANSWER KEY																			
1.	(a)	2.	(a)	3.	(b)	4.	(d)	5.	(c)	6.	(d)	7.	(a)	8.	(b)	9.	(b)	10.	(b)
11.	(c)	12.	(d)	13.	(d)	14.	(d)	15.	(a)	16.	(b)	17.	(d)	18.	(b)	19.	(d)	20.	(c)
21.	(b)	22.	(b)	23.	(b)	24.	(c)	25.	(c)	26.	(a)	27.	(a)	28.	(b)	29.	(a)	30.	(a)
31.	(c)	32.	(c)	33.	(d)	34.	(b)	35.	(a)	36.	(d)	37.	(b)	38.	(c)	39.	(a)	40.	(a)
41.	(b)	42.	(b)	43.	(a)	44.	(b)	45.	(d)	46.	(d)	47.	(b)	48.	(a)	49.	(a)	50.	(c)
51.	(d)	52.	(a)	53.	(b)	54.	(a)	55.	(d)	56.	(b)	57.	(b)						

SOLUTIONS

1. Ans (a) [-1,1]
Explanation: $(-1 \le x \le 1) or [-1,1]$

2. Ans (a) [-1,1]

3. Ans (b) 1
Explanation: Hint: $\tan^{-1} x = \frac{\pi}{4}$

4. Ans (d) $\frac{\pi}{6}$
Explanation: $\cos^{-1}\left(\frac{1}{2}\right) + 3\sin^{-1}\left(\frac{1}{2}\right)$
$= \frac{\pi}{3} + 3 \times \frac{\pi}{6} = \frac{5\pi}{6}$

5. Ans (c) π
Explanation: Hint: $2\left[\sin^{-1}\left(-\frac{1}{2}\right) + \cos^{-1}\left(-\frac{1}{2}\right)\right] =$
$2[\theta_1 + \theta_2]$
Where,
$\theta_1 = \sin^{-1}\left(-\frac{1}{2}\right)$
$\Rightarrow \sin\theta_1 = -\frac{1}{2} = -\sin\frac{\pi}{6} = \sin\left(-\frac{\pi}{6}\right)$
$\Rightarrow \theta_1 = -\frac{\pi}{6} \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
Also, $\theta_2 = \cos^{-1}\left(-\frac{1}{2}\right)$
$\Rightarrow \cos\theta_2 = -\frac{1}{2} = \cos\left(\frac{-\pi}{3}\right)$
$= \cos\left(\pi - \frac{2\pi}{3}\right)$
$\Rightarrow \theta_2 = \frac{2\pi}{3} \in [0, \pi]$
$\therefore 2\left[\sin^{-1}\left(-\frac{1}{2}\right) + \cos^{-1}\left(-\frac{1}{2}\right)\right]$
$= 2\left[-\frac{\pi}{6} + \frac{2\pi}{3}\right]$
$= 2\left[\frac{-\pi + 4\pi}{6}\right]$
$= 2 \times \frac{\pi}{2} = \pi$

6. Ans (d) $\frac{\pi}{3}$
Explanation: We have, $\sin^{-1}[\cos(\sin^{-1}\frac{1}{2})]$
Let $\theta = \sin^{-1}\frac{1}{2}$
$\cos\theta = \sqrt{1 - \frac{1}{4}} = \sqrt{\frac{3}{4}} = \frac{\sqrt{3}}{2}$
$\Rightarrow \sin^{-1}[\cos(\sin^{-1}\frac{1}{2})]$
$\sin^{-1}(\cos\theta) = \sin^{-1}\frac{\sqrt{3}}{2}$
$= \sin^{-1}\left(\sin\frac{\pi}{3}\right) = \frac{\pi}{3}$

7. Ans (a) $\frac{2\pi}{7}$
Explanation: Hint: $\sin\left(\frac{33\pi}{7}\right) = \sin\left(4\pi + \frac{5\pi}{7}\right)$
$= \sin\frac{5\pi}{7}$
$= \sin\left(\pi - \frac{2\pi}{7}\right) = \sin\frac{2\pi}{7}$
$\therefore \sin^{-1}\left(\sin\frac{33\pi}{7}\right) = \frac{2\pi}{7}$

8. Ans (b) $-\frac{\pi}{4}$
Explanation: Hint:
Let
$x = \tan^{-1}(\tan^{-1}\tan\frac{3\pi}{4})$
So that

CUET 2025

SCAN HERE FOR DISCUSSION

MATHEMATICS

Previous year Question paper

Q1. For the function $f(x) = -2x^3 + 3x^2 + 36x - 10$, which of the following is/are true?

(A) f is increasing in $(-\infty, -2)$

(B) f is increasing in $(-2, 3)$

(C) f is decreasing in $(-\infty, -2)$

(D) f is decreasing in $(3, \infty)$

Choose the correct answer from the options given below:

(a) (B) and (D) only

(b) (B), (C) and (D) only

(c) (A) and (D) only

(d) (B) Only

Q2. Area of the region bounded by $y = x^2$ and the line $y = 16$ is

(a) $\frac{256}{3}$ square units

(b) $\frac{128}{3}$ square units

(c) $\frac{64}{3}$ square units

(d) $\frac{32}{3}$ square units

Q3. The solution of the differential equation $ydx + (x - y^2)dy = 0$ is

(a) $3xy + x^3 = C$: C is an arbitrary constant

(b) $3xy + y^3 = C$: C is an arbitrary constant

(c) $3xy - y^3 = C$: C is arbitrary constant

(d) $3xy - x^3 = C$: C is arbitrary constant

Q4. $\int \frac{e^{2x} - e^{-2x}}{e^{2x} + e^{-2x}} dx$ is equal to

(a) $\frac{1}{2}\log_e \left|e^{2x} - e^{-2x}\right| + C$, where C is an arbitrary constant.

(b) $\log_e \left|e^{2x} - e^{-2x}\right| + C$, where C is an arbitrary constant.

(c) $\frac{1}{2}\log_e \left|e^{2x} + e^{-2x}\right| + C$, where C is an arbitrary constant.

(d) $\log_e \left|e^{2x} + e^{-2x}\right| + C$, where C is an arbitrary constant.

Q5. If x is real, the minimum value of $x^2 - 8x + 20$ is

(a) (A) 4

(b) (B) 2

(c) (C) 0

(d) (D) -1

Q6. If $\begin{bmatrix} 3 & 1 \\ 2 & 1 \end{bmatrix} A \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$, then matrix ' A ' is

(a) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$

(b) $\begin{bmatrix} -1 & 1 \\ 3 & -4 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & -1 \\ -3 & 4 \end{bmatrix}$

(d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Q7. Consider an LPP: Maximise $Z = 50x + 15y$ subjected to constraints

$x + y \leq 60$,

$5x + y \leq 100$,

$x, y \geq 0$.

If the maximum value of Z occurs at $x = \alpha$ and $y = \beta$, then the value of $\alpha + \beta$ is

(a) 10

(b) 60

(c) 50

(d) 40

Q8. If $y = \frac{1}{\sqrt[3]{1-x^3}}$, then $\frac{dy}{dx}$ is equal to

(a) $x(1 - x^3)^{-4/3}$

(b) $x^2(1 - x^3)^{-4/3}$

(c) $(1 - x^3)^{-4/3}$

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1 MATHEMATICS

Mock Test

Q1. If $\begin{bmatrix}1 & 3\\4 & 5\end{bmatrix}\begin{bmatrix}x\\2\end{bmatrix}=\begin{bmatrix}5\\6\end{bmatrix}$, then value x is:

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

Q2. The solution region of the inequality $2x + 4y \leq 9$ is:

(a) Open half plane containing origin
(b) Closed half plane containing origin
(c) Open half plane not containing origin
(d) Closed half plane not containing origin

Q3. The angle between the lines $\vec{r} = 3\hat{i} - 2\hat{j} + 1\hat{k} + \mu(4\hat{i} + 6\hat{j} + 12\hat{k})$ and $\vec{r} = 7\hat{i} - 3\hat{j} + 9\hat{k} + \lambda(5\hat{i} + 8\hat{j} - 4\hat{k})$ is:

(a) $\cos^{-1}\frac{10}{7\sqrt{105}}$
(b) $\cos^{-1}\frac{5}{72}$
(c) $\cos^{-1}\frac{2}{35}$
(d) $\cos^{-1}\frac{7}{98}$

Q4. For $a, b > 0$. if $P = \begin{bmatrix}0 & -a\\2a & b\end{bmatrix}$ and $Q = \begin{bmatrix}b & a\\-b & 0\end{bmatrix}$ are two matrices such that $PQ = \begin{bmatrix}2 & 0\\3 & 8\end{bmatrix}$, then the value of $(a + b)^{ab}$ is :

(a) 8
(b) 9
(c) $1/9$
(d) $-1/27$

Q5. The area (in square units) enclosed between the curve $x^2 = 4y$

(a) 8
(b) $\frac{16}{3}$
(c) 16
(d) $\frac{8}{3}$

Q6. The integrating factor of the differential equation $(y \log_e y)\frac{dx}{dy} + x = 2\log_e y$ is:

(a) 1
(b) $\frac{1}{y}$
(c) $\log_e y$
(d) $\log_e(\log_c y)$

Q7. The value of $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\tan^{18} x}$ is:

(a) $\frac{\pi}{4}$
(a) $\frac{\pi}{4}$
(c) $\frac{\pi}{9}$
(b) $\frac{\pi}{6}$

Q8. An objective function $Z = ax + by$ is maximum at points (8,2) and (4,6). If $a \geq 0$ and $b \geq 0$ and $ab = 25$, then the maximum value of the function is equal to:

(a) 60
(b) 50
(c) 40
(d) 80

Q9. The distance between the lines $\vec{r} = \hat{i} - 2\hat{j} + 3\vec{k} + \lambda(2i + 3\hat{j} + 6\hat{k})$ and $\bar{r} = 3\hat{i} - 2\hat{j} + 1\hat{k} + \mu(4\hat{i} + 6\hat{j} + 12\hat{k})$ is

(a) $\frac{\sqrt{28}}{7}$
(b) $\frac{\sqrt{199}}{7}$
(c) $\frac{\sqrt{328}}{7}$
(d) $\frac{\sqrt{421}}{7}$

Q10. If $f(x) = 2\left(\tan^{-1}(e^x) - \frac{\pi}{4}\right)$. then f(x) is :

(a) even and is strictly increasing in $(0, \infty)$
(b) even and is strictly decreasing in $(0, \infty)$
(c) odd and is strictly increasing in $(-\infty, \infty)$
(d) odd and is strictly decreasing in $(-\infty, \infty)$

Q11. For a square matrix $A_{n\times n}$

(a) $|\text{adj}A| = |A|^{n-1}$
(b) $|A| - |\text{ad}|A|^{n-1}$
(c) $|\text{adj } A| = |A|$
(d) $|A^{-1}| = \frac{1}{|A|}$

Q12. Given $A = \begin{bmatrix}2 & 3\\1 & 4\end{bmatrix}$ and $B = \begin{bmatrix}x & y\\1 & 4\end{bmatrix}$, If $A = B$, then x and y are:

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

Q13. If $\begin{vmatrix}3x & 4\\7 & x\end{vmatrix} = \begin{vmatrix}6 & 3\\2 & 1\end{vmatrix}$ then:

(a) $x^2 = \frac{26}{3}$
(b) $x^2 = \frac{25}{3}$
(c) $x^2 = \frac{23}{3}$
(d) $x^2 = \frac{28}{3}$

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