CUET UG 2023 Mathematics Question Paper PDF (May 27, 2023) (Shift 1)

Q1. $f(x) = x^3 + px^2 + qx + 10$ has a maximum at $x = -3$ and a minimum at $x = 1$. The values of p and q are:
(a) $p = -3, q = -9$
(b) $p = 3, q = 9$
(c) $p = -3, q = 9$
(d) $p = 3, q = -9$

Q2. Area of the region bounded by ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is:
(a) πab sq. units
(b) ab sq. units
(c) πa sq. units
(d) πb sq. units

Q3. If the feasible region of a system of linear inequalities can be enclosed within a circle then it is called
(a) Shaded area
(b) Bounded region
(c) Circular region
(d) Unbounded region

Q4. $y = \log_e\left(\frac{1-x^2}{1+x^2}\right)$, then $\frac{dy}{dx}$ is equal to:
(a) $\frac{4x^3}{1-x^4}$
(b) $\frac{-4x}{1-x^4}$
(c) $\frac{1}{4-x^4}$
(d) $\frac{-4x^3}{1-x^4}$

Q5. If $x = t^4, y = t$, then $\frac{d^2y}{dx^2}$ is given by _____.
(a) $-\frac{3}{16t^7}$
(b) $\frac{3}{16t^7}$
(c) $-\frac{3}{4t^4}$
(d) $\frac{3}{16t^4}$

Q6. The value of the determinant $\begin{vmatrix} 66 & 18 & 36 \\ 1 & 3 & 4 \\ 11 & 3 & 6 \end{vmatrix}$ is:
(a) -1
(b) 1
(c) 0
(d) 2

Q7. Points at which normal to the curve $y = x^3 - 3x$ is parallel to y-axis are:
(a) $(1, 2)$ and $(1, -2)$
(b) $(1, -2)$ and $(-1,\ 2)$
(c) $(1,\ 2)$ and $(-1, -2)$
(d) $(-1,\ 2)$ and $(1,\ 2)$

Q8. One root of the equation $\begin{vmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix} = 0$ is:
(a) $\frac{8}{3}$
(b) $\frac{2}{3}$
(c) $\frac{1}{3}$
(d) $\frac{16}{3}$

Q9. The probability distribution of a random variable X is given by

X	0	1	2	3	4
P(X)	0.1	k	2k	2k	k

The value of k is:
(a) 0
(b) 0.1
(c) 1
(d) $\frac{3}{20}$

Q10. The inverse of the matrix $\begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}$ is:
(a) $\begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}$
(b) $\begin{bmatrix} -2 & 1 \\ -1 & 0 \end{bmatrix}$
(c) $\begin{bmatrix} 2 & 1 \\ -1 & 0 \end{bmatrix}$
(d) $\begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$

Q11. $\int_0^2 (x^2 + 1)dx$ is equal to
(a) $\frac{14}{3}$
(b) 4
(c) 10
(d) 8

Q12. $\int \frac{x}{x^2+x-12} dx$ is equal to
(a) $\frac{3}{7}\log|x-3| + \frac{4}{7}\log|x+4| + C$
(b) $-\frac{3}{7}\log|x-3| + \frac{4}{7}\log|x+4| + C$
(c) $\frac{4}{7}\log|x-3| + \frac{3}{7}\log|x+4| + C$
(d) $\frac{4}{7}\log|x-3| - \frac{3}{7}\log|x+4| + C$

Q13. There are 4 bulbs out of which 2 are defective. Each bulb is tested in random order till both the defective bulbs are identified. The probability that only two tests are required to identify the defective bulb is:
(a) $\frac{1}{2}$
(b) $\frac{1}{3}$
(c) $\frac{1}{6}$
(d) $\frac{1}{4}$

Q14. Corner points of the feasible region for a liner programming problem are (0, 2), (3, 0), (6, 0) 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) Any point on the line joining the points (0, 2) and (3, 0) only
(d) The mid - point of the segment joining the points (0, 2) and (3, 0) only.

Q15. Match List I with List II

	LIST I		LIST II
A.	$\frac{d^2y}{dx^2} = \left(\frac{dy}{dx}\right)^{\frac{3}{2}}$	I.	order + degree =2
B.	$2\left(\frac{d^3y}{dx^3}\right)^2 + 3\left(\frac{d^2y}{dx^2}\right) + y\left(\frac{dy}{dx}\right)^2 = e^x$		order +degree = 3
C.	$\frac{dy}{dx} + \frac{1}{\frac{dy}{dx}} = 3$	III.	order +degree =4
D.	$\frac{dy}{dx} + x^2 = 5$	IV.	order +degree =5

Choose the correct answer from the options given below:
(a) A-III, B-IV, C-II, D-I
(b) A-III, B-IV, C-I, D-II
(c) A-IV, B-III, C-I, D-II
(d) A-IV, B-III, C-II, D-I

Q16. For $x \in [-2, 2]$, let $f(x) = x^2 + 2$
A. $f(x)$ is continuous in $[-2, 2]$
B. $f(x)$ is differentiable in $(-2, 2)$
C. $f(-2) = f(2) = 6$
D. $f'(1) = 0$
Choose the correct answer from the options given below:
(a) A, D only
(b) B, C, D only
(c) A, B, C, D only
(d) A, B and C only

Q17. The area of region bounded by two curves $y^2 = x$ and $x^2 = y$ is:
(a) 1 sq. unit
(b) $\frac{1}{2}$ sq. unit
(c) $\frac{1}{3}$ sq. unit
(d) $\frac{2}{3}$ sq. unit

Q18. The value of $\begin{vmatrix} \sin 15° & \cos 15° & 2\sin 30° \\ \sin 30° & \cos 30° & \sin 45° \\ \cos 75° & \sin 75° & \sin 90° \end{vmatrix}$ is:
(a) 1
(b) 0
(c) $\frac{1}{2}$
(d) $\frac{\sqrt{3}}{2}$

Q19. The area of the parallelogram of which $\hat{\imath}$ and $\hat{\imath} + \hat{\jmath}$ are adjacent sides is _____
(a) 1
(b) 2
(c) $\frac{1}{2}$
(d) $\sqrt{2}$

Q20. Match List I with List II

LIST I	LIST II

A.	$\int \sin x \cos x \, dx$	I.	$\log(1 + \sin^2 x) + C$
B.	$\int \frac{dx}{\sin^2 \cos^2 x}$	II.	$\tan\frac{x}{2} + C$
C.	$\int \frac{\sin 2x}{1 + \sin^2 x} dx$	III.	$-\frac{1}{4}\cos 2x + C$
D.	$\int (1 - \cos x)\, cosec^2 x \, dx$	IV.	$\tan x - \cot x + C$

Choose the correct answer from the options given below:
(a) A-III, B-IV, C-I, D-II
(b) A-IV, B-I, C-II, D-III
(c) A-III, B-II, C-IV, D-I
(d) A-II, B-III, C-IV, D-I

Q21. A card is picked at random from a pack of 52 playing cards. Given that the picked card is a queen, the probability of this card to be a card of spade is:
(a) $\frac{1}{3}$
(b) $\frac{4}{13}$
(c) $\frac{1}{4}$
(d) $\frac{1}{2}$

Q22. The integrating factor of the differential equation $x\frac{dy}{dx} - y = \sin x$ is:
(a) $-\frac{1}{x}$
(b) x
(c) $e^{\log x}$
(d) $\frac{1}{x}$

Q23. Area of the region bounded by the curve $y = \frac{1}{2}\cos x$ and x - axis between $x = 0$ and $x = 2\pi$ is:
(a) 2 sq. units
(b) 4 sq. units
(c) 3 sq. units
(d) 1 sq. units

Q24. The number of all possible matrices of order 2 × 2 with each entry 0, 1, 2, and 3 is:
(a) 16
(b) 64
(c) 256
(d) 1024

Q25. Match List I with List II

	LIST I		LIST II
A.	If $4\sin^{-1}x + \cos^{-1}x = \pi$, then x equal to	I.	$\frac{\pi}{2}$
B.	The value of $\frac{1-\tan^2 15^\circ}{1+\tan^2 15^\circ}$	II.	$\frac{1}{2}$
C.	If $x + \frac{1}{x} = 2$, then principal value of $\sin^{-1}x$ is	III.	$\frac{3\pi}{4}$
D.	Two angles of a triangle are $\cot^{-1}2$ and $\cot^{-1}3$, then third angle is	IV.	$\frac{\sqrt{3}}{2}$

Choose the correct answer from the options given below:
(a) A-II, B-IV, C-I, D-III
(b) A-III, B-I, C-IV, D-II
(c) A-I, B-II, C-III, D-IV
(d) A-IV, B-III, C-II, D-I

Q26. The value of k for which the following system of equations does not possess a unique solution is:
$kx + 3y - z = 1$
$x + 2y + z = 2$
$-kx + y + 2z = -1$
(a) $-\frac{7}{2}$
(b) $\frac{7}{2}$
(c) 7
(d) 7–

Q27. The direction cosines of the line
$x - y + z - 5 = 0 = x - 3y - 6 = 0$
(a) 2, –4, 1
(b) 3, 1, –2
(c) $\frac{3}{\sqrt{14}}, \frac{1}{\sqrt{14}}, \frac{-2}{\sqrt{14}}$
(d) $\frac{3}{\sqrt{14}}, \frac{-4}{\sqrt{14}}, \frac{1}{\sqrt{14}}$

Q28. The image of the point (3, –2, 1) in the plane $3x - y + 4z = 2$ is:
(a) (3, –1, 4)
(b) (0, – 1, –3)
(c) $\left(\frac{3}{2}, -\frac{5}{2}, -1\right)$
(d) (0, – 1, 3)

Q29. $\int_0^{\frac{\pi}{4}} \frac{\sin 2x}{\cos^4 x + \sin^4 x} dx =$
(a) $\frac{\pi}{2}$
(b) $\frac{\pi}{4}$
(c) π
(d) 0

Q30. If $y = A\sin x + B\cos x$, then which of the following is correct?
(a) $\frac{d^2y}{dx^2} - y = 0$
(b) $\frac{d^2y}{dx^2} + y = 0$
(c) $\frac{d^2y}{dx^2} = \frac{dy}{dx}$
(d) $\frac{d^2y}{dx^2} = \frac{-dy}{dx}$

Q31. The feasible region of the constraints $x \geq 0$, $x + y \leq 1$ and $x - y \leq 1$ is situated in:
(a) I and II quadrant
(b) II and III quadrant
(c) I and IV quadrant
(d) I, II, III and IV quadrants

Q32. Match List I with List II

	LIST I		LIST II
A.	$\lim_{x\to 0} \frac{1-\cos 2x}{3x^2}$	I.	2
B.	$\lim_{x\to 4} \frac{x^2-16}{x-4}$	II.	8
C.	$\lim_{x\to 0} \frac{\sin ax + 4x}{ax + \sin 4x}$	III.	1
D.	$\lim_{z\to 1} \frac{z^{\frac{1}{3}} - 1}{z^{\frac{1}{6}} - 1}$	IV.	$\frac{2}{3}$

Choose the correct answer from the options given below:
(a) A-I, B-II, C-II, D-IV
(b) A-IV, B-II, C-III, D-I
(c) A-IV, B-II, C-I, D-III
(d) A-III, B-I, C-IV, D-II

Q33. Match List I with List II

	LIST I		LIST II
A.	Range of $cosec^{-1}x$	I.	$(0, \pi)$
B.	Range of $\tan^{-1}x$	II.	$[0, \pi] - \left\{\frac{\pi}{2}\right\}$
C.	Range of $\sec^{-1}x$	III.	$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right] - \{0\}$
D.	Range of $\cot^{-1}x$	IV.	$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

Choose the correct answer from the options given below:
(a) A-II, B-IV, C-III, D-I
(b) A-III, B-IV, C-II, D-I
(c) A-III, B-IV, C-I, D-II
(d) A-IV, B-III, C-I, D-II

Q34. If $f: R \to A$ given by $f(x) = x^2 - 6x + 12$ is a surjective function, then the set A is:
(a) $(3, \infty)$
(b) $(-\infty, 3)$
(c) $[3, \infty)$
(d) $(-\infty, 3)]$

Q35. Let $P = [a_{ij}]$ be a 3 × 3 matrix and let $Q = [b_{ij}]$ where $b_{ij} = 2^{i+j} a_{ij}$ $\forall$ $1 \leq i, j \geq 3$. If the determinant of P is 2, then the determinant of Q is:
(a) 2^{13}
(b) 2^{12}
(c) 2^{11}
(d) 2^{10}

Q36. Suppose 10% of men and 0.5% of women have grey hair. A grey hair person is selected at random. If there are equal number of males and females, then the probability of the selected person being a female is

(a) $\frac{20}{21}$
(b) $\frac{1}{21}$
(c) $\frac{1}{200}$
(d) $\frac{1}{5}$

Q37. For $x < \frac{1}{2}$, derivative of $\tan^{-1}\left(\frac{1+2x}{1-2x}\right)$ with respect to $\sqrt{1+4x^2}$ is:

(a) $\frac{2x}{1+4x^2}$
(b) $\frac{1}{2x\sqrt{1+4x^2}}$
(c) $\frac{1}{x\sqrt{1+4x^2}}$
(d) $2x\sqrt{1+4x^2}$

Q38. Radius of a spherical balloon is increasing at the rate of 0.5 cm/sec; then the rate of increase of its volume when radius is 10 cm is

(a) 150π cm^3/sec
(b) 200π cm^3/sec
(c) 400π cm^3/sec
(d) 300π cm^3/sec

Q39. If the relation R: A → B, where A = {2, 3, 4} and B = {3, 4, 5} is defined by R $\{(x, y): x < y, x \in A, y \in B\}$ then

(a) R = {(2, 3), (2, 4), (3, 4), (3, 5), (4, 4)}
(b) R = {(2, 3), (2, 4), (2, 5), (3, 5), (4, 5)}
(c) R = {(2, 3), (2, 4), (2, 5), (3, 4), (3, 5), (4, 5)}
(d) R = {(2, 3), (2, 5), (3, 3), (3, 5), (4, 4), (4, 5)}

Q40. The slope of the normal to the curve $y = x^3 - 4\sin x$ at $x = 0$ is:

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

Q41. If the difference of two unit vectors is again a unit vector, then the angle between them is _____.

(a) 30°
(b) 45°
(c) 60°
(d) 90°

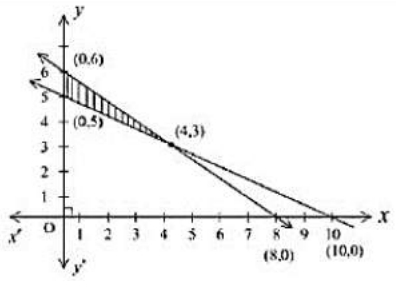
Q42. The function $f(x) = \cos x$ is strictly decreasing in:

(a) $\left(\frac{\pi}{2}, \frac{3\pi}{2}\right)$
(b) $(0, 2\pi)$
(c) $(\pi, 2\pi)$
(d) $(0, \pi)$

Q43. If order of matrices A, B and C are $4 \times 3, 5 \times 4$ and 3×7 respectively, then order of $C' \times (A' \times B')$ is _____.

(a) 7×5
(b) 4×5
(c) 4×3
(d) 5×7

Q44. According to the graph drawn here, identify the constraints of the associated linear programming problem:



(a) $x, y \geq 0,\ x + 2y \geq 10,\ 3x + 4y \geq 24$
(b) $x, y \geq 0,\ x + 2y \leq 10,\ 3x + 4y \leq 24$
(c) $x, y \geq 0,\ x + 2y \leq 10,\ 3x + 4y \geq 24$
(d) $x, y \geq 0,\ x + 2y \geq 10,\ 3x + 4y \leq 24$

Q45. Match List I with List II

	LIST I		LIST II
A.	If $A^{-1} = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}$, then A is	I.	$\begin{bmatrix} 5 & 2 \\ 7 & 3 \end{bmatrix}$
B.	If $A = \begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix}$, then AA^T is	II.	$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$
C.	If $A^{-1} = \begin{bmatrix} 5 & 7 \\ 2 & 3 \end{bmatrix}$, then $(A^T)^{-1}$ is	III.	$\begin{bmatrix} -3 & 2 \\ \frac{5}{2} & -\frac{3}{2} \end{bmatrix}$
D.	If $A = [a_{ij}]_{2\times 2}$ where $a_{ij} = (i-j)^2$, then A is	IV.	$\begin{bmatrix} 5 & 5 \\ 5 & 10 \end{bmatrix}$

Choose the correct answer from the options given below:

(a) A-II, B-IV, C-III, D-I
(b) A-IV, B-III, C-I, D-II
(c) A-III, B-IV, C-I, D-II
(d) A-I, B-IV, C-III, D-II

Q46. The maximum number of equivalence relations on the set $A = \{3, 5, 7\}$

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

Q47. The maximum value of $\frac{\log x^3}{3x}$ occurs at $x =$ _____

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

Q48. The function $f(x) = \frac{x}{(x-2)(x-3)(x-5)}, x \in \mathbb{R}$ is

(a) continuous everywhere
(b) not continuous anywhere
(c) discontinuous at $x = 2, 3, 5$
(d) discontinuous at $x = 0$

Q49. The order and degree of differential equation $\sqrt[3]{2y + \frac{dy}{dx}} = \left(x + \frac{d^3y}{dx^3}\right)$ respectively are:

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

Q50. The projection of $\hat{i} - \hat{j}$ on the vector $\hat{i} + \hat{j}$ is:

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