CUET UG 2023 Mathematics Question Paper PDF (May 30, 2023) (Shift 2)

Q1. The value of $\int_{-\frac{\pi}{2}}^{\pi/2}(x^5+x^3+x+2)\,dx$ is:

(a) 0
(b) 2
(c) 2π
(d) π

Q2. Area bounded by the curves $y^2 = 9x$ and $y = 3x$ is:

(a) $\frac{2}{3}$ sq units

(b) $\frac{1}{3}$ sq units

(c) $\frac{1}{2}$ sq units

(d) 2sq units

Q3. Let A and B be two events in a random experiment with sample space such that P(B) ≠ 0 and P(A|B) = 1. Which of the following is true?

(a) A C B
(b) B C A
(c) A = ∅
(d) B = ∅

Q4. A random variable x has the following probability distribution.

x	1	2	3	4	5	6
P(x)	α	0.1	0.3	β	0.4	0.1

In the above table, P[x = 1 or x = 4] is equal to:

(a) 0.05
(b) 0.01
(c) 0.1
(d) 0.5

Q5. The function $f(x) = \begin{vmatrix} x^2 & x \\ 3 & 1 \end{vmatrix}, x \in \text{IR}$ has a:

(a) local maximum at x = 3
(b) local minimum at $x = \frac{3}{2}$
(c) local maximum at $x = \frac{3}{2}$
(d) local minimum at x = 0

Q6. $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} = \begin{vmatrix} 2 & 3 \\ 8 & 9 \end{vmatrix} + y\begin{vmatrix} 1 & 3 \\ 7 & 9 \end{vmatrix} + z\begin{vmatrix} 1 & 2 \\ 7 & 8 \end{vmatrix}$ Then x + y + z is:

(a) 15
(b) 5
(c) 5
(d) 0

Q7. Given that the function $f(x)$ is continuous on R. Match List – I with List – II.

	List – I		List – II
(A)	$f(x) = \begin{cases} kx^2, & if\ x < 3 \\ 3, & if\ x \geq 3 \end{cases}$	(I)	$k = \frac{5}{4}$
(B)	$f(x) = \begin{cases} kx+1 & if\ x \geq 4 \\ x+2 & if\ x < 4 \end{cases}$	(II)	k = 1
(C)	$f(x) = \begin{cases} \frac{5+x}{2}, & if\ x \neq 0 \\ 3k, & if\ x = 0 \end{cases}$	(II)	$k = \frac{1}{3}$
(D)	$f(x) = \begin{cases} x+k, & if\ x > -2 \\ -3, & if\ x \leq -2 \end{cases}$	(IV)	$k = \frac{5}{6}$

Choose the correct answer from the options given below:

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

Q8. If A is a square matrix and |A| = 4, then the value of |AA′| where A′ is transpose of A, is:

(a) 16
(b) 4
(c) 2
(d) 8

Q9. If $x = \log t^2$ and $y = (\log t)^2$ then $\frac{d^2y}{dx^2}$ is:

(a) 2
(b) $\frac{1}{2}$
(c) $\frac{\log t}{t}$
(d) $\frac{4\log 5-4}{t^6}$

Q10. If A, B and C are all the corner points of feasible region (bounded) of an LPP with objective function Z that needs to be maximized such that $Z_A > Z_B$ and $Z_C < Z_A$(Here Z_A denotes value of Z at A), then which of the following statements is TRUE?

(a) There are infinitely many optimal solutions
(b) There are exactly two optimal solutions
(c) There is a unique optimal solution
(d) Optimal solution does not exist

Q11. A square matrix $B = [bij]_{n\times n}$ where
bij = 0 when i#j
bij = k when i = j for some constant k is called:

(a) Diagonal matrix
(b) Identify matrix
(c) Scalar matrix
(d) Null matrix

Q12. A car starts from a point P at time t = 0 seconds and stops at Q. the distance x, in meters, covered by it in t seconds is given by $x(t) = t^3\left(3 - \frac{t^2}{5}\right)$ the distance between P and Q is:

(a) $\frac{162}{3}m$
(b) $\frac{162}{5}m$
(c) 162 m
(d) $\frac{162}{9}m$

Q13.

Resource	Found 1 (x kg)	II (y kg)	Requirement units
Calcium (units/kg)	3	2	9
Vitamin (units /kg)	4	1	5
Cost (Rs/kg)	40	60	

Formulate the L.P.P. to minimize the cost

(a) Min z = 40x + 60y
$3x + 2y \geq 9$
$4x + y \geq 5$
$x, y \geq 0$

(b) $Min\ z = 9x + 5y$
$3x + 2y \geq 40$
$4x + y \geq 60$
$x, y \geq 0$

(c) Min z = 40x + 60 y
$3x + 2y \leq 9$
$4x + y \leq 10$
$x, y \leq 0$

(d) $Min\ z = 9x + 5y$
$3x + 2y \leq 40$
$4x + y \geq 60$
$x, y \geq 0$

Q14. Match List – I with List – II

	List – I General solution		List – II Differential Equation
(A)	$y = cx$	(B)	$y' = \frac{1}{2\sqrt{x}} - 1$
(B)	$y = e^{-3x} + c$	(II)	$y' + 3y = 0$
(C)	$x + y = \sqrt{x}$+c	(III)	$y' = \frac{y^2}{1 - xy}\ (xy \neq 1)$
(D)	$xy = \log y + c$	(IV)	xy' = y

(c is an arbitrary constant and $y' = \frac{dy}{dx}$)
(a) (A)-(IV), (B)-(I), (C)-(II), (D)-(III)
(b) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
(c) (A)-(IV), (B)-(II), (C)-(III), (D)-(I)
(d) (A)-(IV), (B)-(II), (C)-(I), (D)-(III)

Q15. $\int_0^2 \frac{\sqrt{x}}{\sqrt{x}+\sqrt{2-x}}$ dx is equal to:
(a) 0
(b) 2
(c) $\frac{3}{2}$
(d) 1

Q16. Solution of differential equation $\frac{dy}{dx} = \cos(x + y + 3)$ is:
(a) $y = -\sin(x + y + 3) + c$
(b) $y = \sin(x + y + 3) + c$
(c) $y = 2\tan^{-1}(x + c) - x - 3$
(d) $y = \frac{1}{2}\tan^{-1}(x + c) + x + 3$

Q17. If $\cos^{-1}\alpha + \cos^{-1}\beta + \cos^{-1}\gamma = 3\pi$ then value of $\alpha^2\beta^2\gamma^2 + 3(\alpha + \beta + \gamma) =$
(a) 8
(b) 0
(c) 10
(d) 10

Q18. The domain of the function $\sin^{-1}(4x - 1)$ is:
(a) $[-1, 1]$
(b) $[0, 1]$
(c) $\left[0, \frac{1}{2}\right]$
(d) $\left[-\frac{1}{2}, \frac{1}{2}\right]$

Q19. The number of solutions of the system of equations
$\alpha^2 x + \alpha y = -1$
$\alpha x + \alpha^2 y = 1$
is infinite. Then α is:
(a) 0
(b) 1
(c) - 1
(d) 2

Q20. Maximize z = 2 x - y
Subject to constraints
$x + y \leq 4, x + 3y \leq 6, x \geq 0, y \geq 0.$
The corner points of the feasible region are:
(a) (0, 4), (4, 0), (0, 0), (2, 3)
(b) (0, 2), (6, 0), (0, 0), (1, 2)
(c) (0, 2), (4, 0), (0, 0), (3, 1)
(d) (0, 2), (4, 0), (0, 0), (1, 3)

Q21. Match List – I with List – II

	List – I		List – II
(A)	$\frac{d}{dx}(\sin x^2)$	(I)	$\frac{1}{5}$
(B)	$\frac{d}{dx}(e^{\sin x})$	(II)	0
(C)	$f(x) = \tan^{-1}x$ then f'(2)	(III)	$2x\cos x^2$
(D)	If $y = 3\cos x - 2\sin x$, then $\frac{d^2y}{dx^2} + y$	(IV)	$e^{\sin x}.\cos x$

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

Q22. If $P(A \cap B) = 0.4, P(\bar{A} \cap \bar{B}) = 0.3$ then the value of $P(\bar{A}) + P(\bar{B})$ is:
(a) 0.3
(b) 0.5
(c) 0.7
(d) 0.9

Q23. Equation of a line is $\frac{x-3}{2} = \frac{4-y}{3} = \frac{2-z}{4}$ then its direction cosines are:
(a) 2, 3, 4
(b) 2, −3, −4
(c) $\frac{2}{29}, \frac{-3}{29}, \frac{-4}{29}$,
(d) $\frac{2}{\sqrt{29}}, \frac{-3}{\sqrt{29}}, \frac{-4}{\sqrt{29}}$

Q24. Slope of the tangent to the parabola $y^2 = x + 2$ at a point in 1^{st} quadrant and lying on the line $y = x$ is:
(a) $\frac{1}{2}$

(b) $\frac{1}{4}$
(c) $\frac{1}{3}$
(d) 2

Q25. If $\vec{a} = 5\hat{\imath} + \hat{\jmath} + 3\hat{k}$ then the sum of projections $\vec{a}$ on x axis, y axis and z axis is :
(a) $\frac{9}{\sqrt{35}}$
(b) 9
(c) $\frac{5}{\sqrt{35}}$
(d) 5

Q26. If $\begin{bmatrix} x+y+z+w \\ x+y \\ x+z \\ x+w \end{bmatrix} = \begin{bmatrix} 10 \\ 6 \\ 5 \\ 3 \end{bmatrix}$, find the value of $x^2 + y^2 - (w+z)^2$
(a) 16
(b) 20
(c) 4
(d) 8

Q27. If θ ∈ [0, π] is the angle between any two non zero vectors $\vec{a}$ and $\vec{b}$, such that $\left|\vec{a} \cdot \vec{b}\right| = \left|\vec{a} \times \vec{b}\right|$ then θ=
(a) $\frac{\pi}{2}$
(b) $\frac{\pi}{4}$
(c) 0
(d) π

Q28. The value of $\frac{3}{2}(\hat{\imath} \cdot \hat{\imath}) + \frac{1}{2}(\hat{\jmath} \cdot \hat{\jmath}) + \frac{|\hat{\imath} \times \hat{\imath}|}{(\hat{k} \cdot \hat{k})} + \frac{(\hat{k} \cdot \hat{\imath})}{|\hat{\imath} \times \hat{\jmath}|}$ *is:*
(a) $\frac{5}{2}$
(b) 0
(c) 2
(d) −2

Q29. If a line makes angles $\frac{2\pi}{3}$ and $\frac{\pi}{3}$ with positive direction of x-axis and y-axis respectively, then the acute angle made by the line with positive z-axis is
(a) $\frac{\pi}{3}$
(b) $\frac{\pi}{4}$
(c) $\frac{\pi}{6}$
(d) $\frac{\pi}{2}$

Q30. A is a 2 × 2 non - singular matrix such that adj A = $\begin{bmatrix} \sin\theta - \cos\theta & -\sin\theta \sec\theta \\ 2\cos^2\theta & \sin\theta - \cos\theta \end{bmatrix}$ then |A| is:
(a) 0
(b) 1
(c) −1
(d) −1 or 1

Q31. Let * be a binary operation set Q of rational numbers given by a*b = a + b + ab. Then identity element is:
(a) −1
(b) 0
(c) $\frac{1}{2}$
(d) 1

Q32. For a 3 × 3 matrix A, if A(adj A) = $\begin{bmatrix} 99 & 0 & 0 \\ 0 & 99 & 0 \\ 0 & 0 & 99 \end{bmatrix}$ then det (A) is equal to:
(a) 3×99
(b) $(99)^3$
(c) $(99)^2$
(d) 99

Q33. Let A= {1, 2, 3} and R = {(1, 1), (1, 3), (3, 1), (2, 2), (2, 1), (3, 3)} be a relation on A. Then, R is:
(a) Reflexive
(b) Both Reflexive and Symmetric
(c) Symmetric but not Reflexive
(d) Both Reflexive and Transitive

Q34. Number of solutions of the equation $\begin{vmatrix} -1 & 0 & \sin\theta \\ \sin\theta & -1 & 0 \\ 0 & \sin\theta & -1 \end{vmatrix} = 0 \ in \ (0,\ \pi)$ is:
(a) exactly one
(b) exactly zero
(c) exactly two
(d) infinitely many

Q35. If the function $f(x) = \begin{cases} \frac{\sin 5x}{3x}, & x \neq 0 \\ \frac{k}{3}, & x = 0 \end{cases}$ is continuous at x = 0, then $k^2 - 2k + 10$ is equal to:
(a) 35
(b) 25
(c) 40
(d) 15

Q36. Area bounded between the parabola $y = x^2 - 2$ and the line y = x in square units is:
(a) $\frac{9}{2}$
(b) $\frac{11}{2}$
(c) $\frac{7}{2}$
(d) 5

Q37. If $\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} A = \begin{bmatrix} -1 & -8 & -10 \\ 1 & -2 & -5 \\ 9 & 22 & 15 \end{bmatrix}$, then matrix A is equal to:
(a) $\begin{bmatrix} 1 & 4 & -5 \\ 3 & -4 & 0 \end{bmatrix}$
(b) $\begin{bmatrix} 1 & -2 \\ -5 & 3 \\ 4 & 0 \end{bmatrix}$
(c) $\begin{bmatrix} 1 & -2 & -5 \\ 3 & 4 & 0 \end{bmatrix}$
(d) $\begin{bmatrix} 1 & -3 \\ 2 & -4 \\ 5 & 0 \end{bmatrix}$

Q38. The function $f(x) = x^3 + 1$ is:
(a) increasing in [2, 3]
(b) increasing at x = 1 only
(c) decreasing in [2, 3]
(d) neither increasing nor decreasing

Q39. Area bounded by the curve y = logx, x-axis, x =1 and x = 2 in square units is:
(a) log 4

(b) $\log\left(\frac{4}{e}\right)$
(c) 2log 2 +1
(d) log 4 −2

Q40. Let f :[−2, 2]→ [−2, 2] be a function defined by $f(x) = x|x|$, then f is:
(a) One-one but not onto
(b) Onto but not one-one
(c) Neither one-one nor onto
(d) Bijective

Q41. Number of defective bulbs in a lot of 500 bulbs follows a binomial distribution with probability of a randomly selected bulb to be defective equal to 0.3. A sample of 50 bulbs is drawn. Probability of 2 defective bulbs in the sample is:
(a) $1225\ (0.7)^{50}$
(b) $2450\ (0.3)^2\ (0.7)^{48}$
(c) $1225\ (0.3)^2\ (0.7)^{48}$
(d) $1225\ (0.3)^{50}$

Q42. The maximum number of equivalence relations on the set A = {a, b, c} is:
(a) 1
(b) 2
(c) 5
(d) 3

Q43. If $u = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ and $v = \tan^{-1} x, x \in (-1, 1)$ then, $\frac{du}{dv}$ is equal to:
(a) 3
(b) 0
(c) 1
(d) 2

Q44. The function $z = \alpha x + \beta y\ (\alpha, \beta > 0)$ corresponds to the objective function of an LPP that needs to be maximized subject to $x + y \leq 1, x, y \geq 0$. Then the set of optimal solutions is:
(a) Empty set
(b) {(1, 0)} if α < β
(c) { (0, 1) } if α > β
(d) {(t, 1 −t) : t∈[0, 1]) if α = β

Q45. Order and degree of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^3\right]^{5/4} = \frac{d^2y}{dx^2}$ are:
(a) Order 1, degree 3
(b) Order 2, degree 4
(c) Order 1, degree 4
(d) Order 2, degree 5

Q46. $\lim_{x\to\infty}\left(\frac{x+7}{x+1}\right)^x$ is equal to:
(a) e
(b) e^3
(c) e^6
(d) e^7

Q47. The integral $\int \frac{dx}{\sqrt{\frac{1}{2}-5x-x^2}}$ is equal to:
(a) $\sin^{-1}\frac{2x+5}{3\sqrt{2}} + C$
(b) $\sin^{-1}\frac{2x+5}{3\sqrt{3}} + C$
(c) $\sin^{-1}\frac{2x-5}{3\sqrt{2}} + C$
(d) $\sin^{-1}\frac{2x-5}{3\sqrt{3}} + C$

Q48. The value of the integral $\int_0^{\pi} 2x \sin^3 x\, dx$ is:
(a) $\frac{2\pi}{3}$
(b) π
(c) $\frac{4\pi}{3}$
(d) $\frac{5\pi}{3}$

Q49. The distance between the line $\vec{r} = 2\hat{\imath} + 2\hat{\jmath} - 3\hat{k} + \lambda(\hat{\imath} + \hat{\jmath} + 4\hat{k})$ and the plane $\vec{r}\cdot(\hat{\imath} - 5\hat{\jmath} + \hat{k}) - 4 = 0$ is:
(a) 0
(b) $2\sqrt{3}$
(c) $\frac{4\sqrt{3}}{3}$
(d) $\frac{5\sqrt{3}}{3}$

Q50. Let X denote the number of tails in two tosses of a coin. If the mean and the variance of X are μ and σ^2 respectively, then $\mu + \sigma^2$ is equal to:
(a) $\frac{3}{2}$
(b) 1
(c) 2
(d) $\frac{5}{2}$