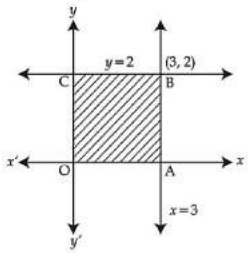
CUET UG 2023 Mathematics Question Paper PDF (May 24, 2023) (Shift 3)

Q1. The feasible region (shaded) for a LPP is shown in the following figure. Then the maximum value of $z = 11x + 7y$ is:



(a) 33
(b) 47
(c) 53
(d) 51

Q2. If A is a matrix of order m × n and B is a matrix such that AB' and B'A are both defined, the order of matrix B is:
(a) n × n
(b) n × m
(c) m × n
(d) m × m

Q3. An unbiased coin is tossed 6 times. The Probability of getting at least one head is:
(a) $\frac{57}{64}$
(b) $\frac{61}{64}$
(c) $\frac{63}{64}$
(d) $\frac{57}{64}$

Q4. In an LPP, if the objective function $Z = ax +$ by has the same maximum value at two corner points of hte feasible region, then the number of points of which Z_{max} occurs is:
(a) 2
(b) 0
(c) finite
(d) infinite

Q5. The matrix A= $\begin{bmatrix} 0 & 0 & 5 \\ 0 & 5 & 0 \\ 0 & 0 & 5 \end{bmatrix}$ is a:
(a) Scalar matrix
(b) Diagonal matrix
(c) Zero matrix
(d) Square matrix

Q6. The sum of the order and degree of the differential equation $\frac{d^2y}{dx^2} + \sqrt[3]{\frac{dy}{dx}} + (1 + x) = 0$ is:
(a) 3
(b) 4
(c) 5
(d) 6

Q7. Which of the following statements are correct?
(A) If elements of a row (or column) of a determinant are multiplied with cofactors of any other row (or column), then their sum is zero.
(B) The value of determinant is equal to the sum of the product of elements of any row (or column) with their corresponding cofactors.
(C) If any two rows (or columns) of a determinant are interchanged, their sign of determinant does not change.
(D) The value of determinant remains unchanged if its rows and columns are interchanged.
(E) A square matrix A has inverse if and only if A is singular.
Choose the correct answer from the options given below:
(a) (A), (B), (D) Only
(b) (C), (D) Only
(c) (B), (D), (E) Only
(d) (B), (E) Only

Q8. If $y = \log\left(x + \sqrt{x^2 + a^2}\right)$ then $\frac{dy}{dx} =$
(a) $\frac{1}{\sqrt{x^2+a^2}}$
(b) $\sqrt{x^2 + a^2}$
(c) $\frac{-1}{\sqrt{x^2+a^2}}$
(d) $-\sqrt{x^2 + a^2}$

Q9. If mean of Binomial distribution is 6 and variance is 2. Then the value of p, where p denotes probability of success is:
(a) $\frac{2}{3}$
(b) $\frac{2}{5}$
(c) $\frac{3}{5}$
(d) $\frac{1}{5}$

Q10. Match List – I with List _ II.

	List -I		List – II
(A)	$\int \frac{dx}{a^2 - x^2}$	(I)	$\frac{1}{2a}\log\left\|\frac{x-a}{x+a}\right\| + C$
(B)	$\int \frac{dx}{x^2 - a^2}$	II	$\frac{1}{2a}\log\left\|\frac{a+x}{a-x}\right\| + C$
(C)	$\int \frac{dx}{x^2 + a^2}$	III	$\sin^{-1}\left(\frac{x}{a}\right) + C$
(D)	$\int \frac{dx}{\sqrt{a^2 - x^2}}$	(IV)	$\frac{1}{a}\tan^{-1}\frac{x}{a} + C$

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

Q11. Area bounded by $x = \frac{y^2}{4}$ and its latus rectum is:

(a) $\frac{2}{3}$ sq. units
(b) $\frac{8}{3}$ sq. units
(c) $\frac{1}{3}$ sq. units
(d) 2 sq. units

Q12. The function $f(x) = x^3$, is increasing for:
(a) Only positive values of x
(b) Only negative values of x
(c) For all real values of x
(d) For only the values of x, such that $-1 \leq x \leq 1$

Q13. The differential equation of the family of lines through the origin is:
(a) $x\frac{dy}{dx} - y = 0$
(b) $x\frac{dy}{dx} + y = 0$
(c) $y - x\frac{dx}{dy} = 0$
(d) $y + x\frac{dy}{dx} = 0$

Q14. If $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$, then x is equal to:
(a) $2\sqrt{2}$
(b) $-2\sqrt{2}$
(c) $\pm 2\sqrt{2}$
(d) 0

Q15. The function $f(x) = 2x^3 - 3x^2 - 12x + 4$ has:
(a) two points of local minimum
(b) two points of local maximum
(c) one maxima and one minima
(d) no maxima or minima

Q16. If A = $\begin{bmatrix} 2-x & 1 \\ 3 & y+2 \end{bmatrix}$ and B=$\begin{bmatrix} y & 1 \\ 3 & 2x+1 \end{bmatrix}$ are such that A= B, then values of x and y are respectively:
(a) 1, 3
(b) 3, 1
(c) 2, 1
(d) 1, 1

Q17. The integral $\int \log x dx$ is equal to :
(a) $xlogx + x + c$
(b) $-xlogx + x + c$
(c) $xlogx - x + c$
(d) $xlogx + x^2 + c$

Q18. If A = $[-1\ 2\ 3]$, B = $\begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}$, C = $[1\ 2\ 3]$ and D = $\begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}$ then AB + CD is equal to:
(a) [27]
(b) [24]
(c) 27
(d) 28

Q19. The unit vector in the direction of sum of vectors $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{j} + \hat{k}$ is:
(a) $\frac{2\hat{i}+\hat{j}+2\hat{k}}{3}$
(b) $2\hat{i} + \hat{j} + 2\hat{k}$
(c) $\frac{2\hat{i}+\hat{j}+2\hat{k}}{5}$
(d) $\frac{2\hat{i}+\hat{j}+2\hat{k}}{7}$

Q20. Which of the following statements are correct?
(A) Direction ratios of the line $\frac{X-1}{2} = \frac{Y+2}{3} = \frac{Z-3}{4}$ are 2, 3, 4,
(B) Direction ratios of the line $\frac{X-1}{2} = \frac{2-y}{7} = \frac{2Z-1}{6}$ are 2, -7,3
(C) Direction cosines of x axis are 0, 1, 0
(D) Direction ratios of the line joining the point (1, 2, - 3) and (4, 5, 6) are 1, 1, 3
(E) Direction cosines of a line which makes equal angles with the coordinate axes are $\frac{1}{3}, \frac{-1}{3}, \frac{1}{3}$
Choose the correct answer from the options given below:
(a) (A), (B), (C) Only
(b) (A), (B), (D) Only
(c) (B), (P), (E) Only
(d) (D), (E) Only

Q21. The greatest integer function f : $R \to R$ given by f(x)= [x] is:
(a) one-one but not onto
(b) onto but not one-one
(c) one-one and onto
(d) neither one-one nor onto

Q22. The derivative of $\frac{\tan^{-1}x}{1+\tan^{-1}x}$ with respect to $\tan^{-1}x$ is:
(a) $\frac{\tan^{-1}x}{(1+\tan^{-1}x)^2}$
(b) $\frac{1}{(1+\tan^{-1}x)^2}$
(c) $(1 + \tan^{-=1}x)^2$
(d) $\frac{\tan^{-1}x}{(1+\tan^{-1}x)^2}$

Q23. The domain of the function $f(x) = \sin^{-1}(2x - 3)$ is:
(a) [1, 2]
(b) [1, 2]
(c) [2, 3]
(d) [2, 3]

Q24. The value of k for which the function $f(x) = \begin{cases} \frac{x^2+3x-10}{x-2} & x \neq 2 \\ k & x = 2 \end{cases}$ is continuous at x= 2; is :
(a) 3
(b) 7
(c) 2
(d) 5

Q25. Which of the following can be an objective function for a Linear programming problems in two variables x and y?
(a) Max $z = 2x^2 + y$
(b) Max $z = 2x + 3y$
(c) Max $z = 2x^2 + \sqrt{y}$
(d) Max $z = x + 2y + \frac{1}{2}xy$

Q26. For the following distribution:

X	1	2	3	4
P(X)	1/10	1/5	3/10	2/5

Var(X) is equal to:
(a) 3

(b) 10
(c) 1
(d) 7

Q27. If $x = a\sin^2\theta, y = a\cos^2\theta$ then $\frac{dy}{dx} =$
(a) –1
(b) 3
(c) 2
(d) 4

Q28. The degree of the differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^3 = \left(\frac{d^3y}{dx^3}\right)^2$ is:
(a) 1
(b) 3
(c) 2
(d) 4

Q29. The corner points of the feasible region determined by the set of constraints (linear inequations) are P(0, 5), Q(3, 5), R(5, 0) and S(4, 1) and the objective function z = ax + 2by where a, b > 0. The condition on a and b such that maximum z occurs at Q and S is:
(a) a – 3b = 0
(b) 5a – 3b = 0
(c) a – 2b = 0
(d) a – 8b = 0

Q30. The area bounded by the y–axis, y = cosx and y = sinx when $0 \le x \le \frac{\pi}{2}$ is:
(a) $\sqrt{2}sq.$ units
(b) $(2\sqrt{2}+1)$ sq. units
(c) $(\sqrt{2}+1)$ sq. units
(d) $(\sqrt{2}-1)$ sq. units

Q31. Which of the following is not correct?
(a) Every matrix has a transpose
(b) Every square matrix has a determinant
(c) Non-diagonal elements of a symmetric matrix must be zero
(d) Diagonal element of a skew-symmetric matrix are zero

Q32. $\begin{vmatrix} x-2 & 1 & 2 \\ 1 & 2x & 1 \\ -1 & 1 & 1 \end{vmatrix} = 3$ then the values of x are:
(a) 1, 2
(b) 1, 1
(c) $1, -\frac{1}{2}$
(d) 2, 1

Q33. The area of the region bounded by the curves $y = x^2 + 2$, y = – x, x = 0 and x = 1 is:
(a) $\frac{5}{16}$
(b) $\frac{7}{16}$
(c) $\frac{17}{6}$
(d) $\frac{6}{17}$

Q34. If the line drawn from the point (–2, –3, –4) meets a plane at right angle at the point (1, –2, 4), then equation of plane is:
(a) 3x + y – 8z – 33 = 0
(b) 3x + y – 6z – 33 = 0
(c) 3x – y + 8z – 33 = 0
(d) 3x + y + 8z – 33 = 0

Q35. If $D_1 = \begin{vmatrix} \frac{1}{2} & \frac{1}{\sqrt{2}} & 0 \\ -\frac{1}{\sqrt{2}} & \frac{1}{2} & 0 \\ 0 & 0 & 1 \end{vmatrix}$ and $D_2 = \begin{vmatrix} \frac{1}{\sqrt{2}} & \frac{1}{2} & 0 \\ -\frac{1}{2} & \frac{1}{\sqrt{2}} & 0 \\ 0 & 0 & 1 \end{vmatrix}$, then D_1D_2 is equal to:
(a) $\frac{1}{2}$
(b) 0
(c) $\frac{9}{16}$
(d) $\frac{1}{\sqrt{2}}$

Q36. Probability A speaks truth is $\frac{4}{5}$. A coin is tossed. A report that a head appears. The probability that actually there was head is:
(a) $\frac{1}{2}$
(b) $\frac{1}{5}$
(c) $\frac{4}{5}$
(d) $\frac{3}{5}$

Q37. The function $f(x) = -2x^3 - 9x^2 - 12x + 5$ is:
(a) increasing in (–2, –1) and decreasing in $(-\infty, -2) \cup (-1, \infty)$
(b) increasing in $(-\infty, -2) \cup (-1, \infty)$ and decreasing in (–2, –1)
(c) increasing in $(0, \infty)$ and decreasing in $(-\infty, 0)$
(d) decreasing in $(0, \infty)$ and increasing in $(-\infty, 0)$

Q38. The slope of normal to the curve y = f(x) is m, then:
(a) $m = -\frac{dy}{dx}$
(b) $m = \frac{dy}{dx}$
(c) $m = \frac{dx}{dy}$
(d) $m = -\frac{dx}{dy}$

Q39. Match list – I with List – II.

	List – I		List – I
(A)	$\int_{-\pi/2}^{\pi/2} \sin^5 x\, dx$	(I)	π
(B)	$\int_{-\pi/2}^{\pi/2} (x^3 + \tan^3 x + 1)\, dx$	(II)	$\frac{\pi}{12}$
(C)	$\int_{0}^{\pi/2} \frac{\cos^5 x}{\cos^5 x + \sin^5 x} dx$	(III)	$\frac{\pi}{4}$
(D)	$\int_{1}^{\sqrt{3}} \frac{dx}{1+x^2}$	(IV)	0

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

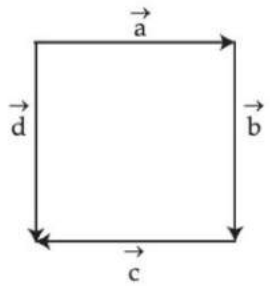
Q40. The relation R = {(1, 1), (2, 2), (3, 3)} on the set {1, 2, 3} is:
(a) Symmetric only
(b) Reflexive only
(c) Transitive only
(d) An equivalence relation

Q41. The integrating factor of the differential equation $x\frac{dy}{dx} + 2y = x^2$ is :

(a) x^2
(b) 2x
(c) e^{2x}
(d) e^x

Q42. If the area of the triangle with vertices A(x,4) (–2, 4) and C (2, –6) is 35 sq units, then the values of x are:
(a) 5, –9
(b) 5, 9
(c) –5, 9
(d) 5, 7

Q43.



Match List -I with List – II. For the figure given above, match the following:

	List – I		List – I
(A)	Coinitial vectors	(I)	$\vec{a}$, $\vec{c}$ and $\vec{b}$, $\vec{d}$
(B)	Equal vectors	(II)	$\vec{a}$ and $\vec{d}$
(C)	Collinear but not equal	(III)	$\vec{b}$ and $\vec{d}$
(D)	Collinear vectors	(IV)	$\vec{a}$ and $\vec{c}$

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

Q44. Which of the following statements are correct?
(A) $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right), xy < 1$
(B) $\tan^{-1}x + \tan^{-1}y = \pi + \tan^{-1}\left(\frac{x+y}{1-xy}\right), xy > 1$
(C) $\tan^{-1}x + cos^{-1}x = \frac{\pi}{2}, x \in (-1, 1)$
(D) $\tan^{-1}x + \cot^{-1}x = \frac{\pi}{2}, x \in R$
(E) $\cos^{-1}(-x) = -\cos^{-1}x, x \in [-1, 1]$
Choose the correct answer from the options given below:
(a) (A), (B), (D) only
(b) (A), (B) only
(c) (D), (E) only
(d) (A), (D), (E) only

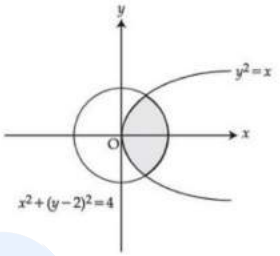
Q45. An edge of a variable cube is increasing at the rate of 3 cm/s. How fast is the volume of the cube increasing when the edge is 10 cm long ?
(a) 100 cm^3/s
(b) 300 cm^3/s
(c) 900 cm^3/s
(d) 600 cm^3/s

Q46. For a set [1 2 3], the following functions are defined from A to A. Which of these functions has an inverse?
(a) $f_1 = \{(1, 1), (2, 2), (3, 3)\}$
(b) $f_2 = \{(1, 1), (1, 2), (3, 3)\}$
(c) $f_3 = \{(1, 2), (2, 3), (3, 2)\}$
(d) $f_4 = \{(1, 3), (2, 3), (3, 1)\}$

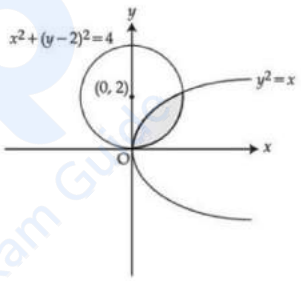
Q47. The point on the curve $y^2 = x$, where the tangent makes an angle of $\frac{\pi}{4}$ with x-axis is:
(a) $\left(\frac{1}{2}, \frac{1}{4}\right)$
(b) $\left(\frac{1}{4}, \frac{1}{2}\right)$
(c) (4, 2)
(d) (2, 4)

Q48. The region bounded by the curve $x^2 + (y-2)^2 = 4, y^2 = x$ and x-axis is correctly represented as:

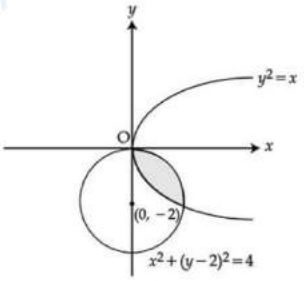
(a)



(b)



(c)



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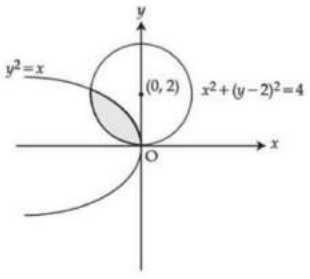

Q49. The differential equation representing family of circles with centre at point (4, 0) is
(a) $\frac{dy}{dx} = \frac{4-x}{y}$
(b) $\frac{dy}{dx} = \frac{y}{4-x}$
(c) $\frac{dy}{dx} = \frac{4+x}{y}$
(d) $\frac{dy}{dx} = \frac{y}{4+x}$

Q50. If $\vec{a}$ and $\vec{b}$ are unit vectors, then the angle between $\vec{a}$ and $\vec{b}$ for $\vec{a} + \sqrt{3}\,\vec{b}$ to be a unit vector is given by :

(a) $\frac{\pi}{6}$

(b) $\frac{5\pi}{6}$

(c) $\frac{\pi}{3}$

(d) $\frac{2\pi}{3}$