CUET UG 2023 Mathematics Question Paper PDF (May 21, 2023) (Shift 3)

SECTION : COMMON

1. $\int \frac{x^3}{x+1} dx$ is equal to

(a) $x - \frac{x^2}{2} + \frac{x^3}{3} - \log|1+x| + C$

(b) $x + \frac{x^2}{2} - \frac{x^3}{3} - \log|1-x| + C$

(c) $x - \frac{x^2}{2} - \frac{x^3}{3} - \log|1+x| + C$

(d) $x + \frac{x^2}{2} + \frac{x^3}{3} - \log|1-x| + C$

2. If $A = \begin{bmatrix} 1 & -1 & 2 \\ -2 & 2 & -4 \\ 0 & 2 & 9 \end{bmatrix}$ then A^{-1} is equal to

(a) $\begin{bmatrix} 2 & -2 & 4 \\ 0 & 2 & 9 \\ -1 & 1 & -2 \end{bmatrix}$ (b) does not exist

(c) $\begin{bmatrix} 0 & 2 & 9 \\ 1 & -1 & 2 \\ -2 & 2 & -4 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & -2 & 0 \\ -1 & 2 & 2 \\ 2 & -4 & 9 \end{bmatrix}$

3. The derivative of $f(x) = 2|x+3|$ at $x = -2$ is
(a) -2 (b) 2
(c) -1 (d) 1

4. A and B are events such that $P(A) = 0.4$, $P(B) = 0.3$ and $P(A \cup B) = 0.5$, then $P(B \cap A')$ is equal to :
(a) 0.2 (b) 0.1
(c) 0.3 (d) 0.4

5. The feasible region represented by the system of inequalities $x + y \le 3, y \le 6, x \ge 0, y \ge 0$ is:
(a) Unbounded in first quadrant
(b) Bounded in first quadrant
(c) Unbounded in first and second quadrant
(d) Bounded in first and second quadrant

6. If A and B are two matrices of orders $3 \times p$ and $3 \times q$ respectively and $p = q$, then the order of $(2A - 5B)$ is:
(a) $3 \times q$ (b) $p \times q$
(c) 3×3 (d) $p \times 3$

7. The area (in sq. units) bounded by the curve $y = \sqrt{16 - x^2}$ and x-axis is:
(a) 8π (b) 20π
(c) 16π (d) 256π

8. The function $y = (x-9)^2$ is strictly increasing in the intervals
(a) $(-\infty, 3)$ (b) $(9, \infty)$
(c) $(-\infty, 3) \cup (9, \infty)$ (d) $(3, 9)$

9. Trials of a random experiment are called Bernoulli trials, if they satisfy certain conditions. Which is the correct condition?
A. There should be infinite number of trials.
B. The trials should be independent.
C. Each trial has exactly two outcomes: success and failure.
D. The probability of success changes in each trial.
Choose the correct answer from the options given below:
(a) A and B only (b) B and D only
(c) A and C only (d) B and C only

10. Solution of the differential equation $\frac{dy}{dx} + ay = e^{mx}$ is:
(a) $(a+m)y = e^{mx} + Ce^{-ax}$
(b) $y = e^{mx} + Ce^{-ax}$
(c) $(a+m)y = me^{mx} + C$
(d) $y.e^{ax} = me^{mx} + C$

11. If A is a square matrix of order 3×3 such that $|A| = 4$, then $|-3A|$ is equal to:
(a) 12 (b) -12
(c) -108 (d) 108

12. If $A = \begin{bmatrix} 2 & 5 \\ 3 & -2 \end{bmatrix}$ be such that $A^{-1} = kA$, then k is equal to:

(a) $-\frac{1}{19}$ (b) -19

(c) 19 (d) $\frac{1}{19}$

13. The order and degree of the differential equation of the family of curves $y = a(x + b)$ where, a, b are arbitrary constants, are respectively.

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

14. The set of values of decision variables that satisfy the linear constraints and non-negative conditions of a linear programming problem is called its:
(a) Unbounded solution
(b) Bounded solution
(c) Feasible solution
(d) Optimum solution

15. The point on the curve $y = -x^2 + 12x + 5$ where the tanget is parallel to the x-axis is:
(a) $(-6, -103)$ (b) $(6, 41)$
(c) $(0, 5)$ (d) $(6, 103)$

SECTION : CORE MATHEMATICS

1. The function $f(x) = 3x^2$ is:
(a) increasing in $(-\infty, -1) \cup (1, \infty)$ and decreasing in $(-1, 1)$
(b) decreasing in $(-\infty, -1) \cup (1, \infty)$ and increasing in $(-1, 1)$
(c) increaing in $(0, \infty)$ and decreasing in $(-\infty, 0)$
(d) decreaing in $(0, \infty)$ and increasing in $(-\infty, 0)$

2. If $\cos^{-1}\alpha + \cos^{-1}\beta + \cos^{-1}\gamma = 3\pi$, then $\alpha(\beta+\gamma) + \beta(\gamma+\alpha) + \gamma(\alpha+\beta)$ equals:
(a) 0 (b) 1
(c) 6 (d) 12

3. If sin x is the integrating factor of the linear differential equation $\frac{dy}{dx} + Py = Q$ then P is:
(a) tan x (b) cos x
(c) cot x (d) log sin x

4. The corner points of the feasible region for an LPP are (0, 10), (5, 5), (15, 15) and (0, 20). If the objective function is $Z = px + qy$; $p, q > 0$, then the condition on p and q so that the maximum of Z occurs at (15,15) and (0, 20) is:
(a) $p = q$ (b) $p = 2q$
(c) $q = 2p$ (d) $q = 3p$

5. If $A = \begin{bmatrix} 1 & 3 & 9 \\ 1 & x & x^2 \\ 4 & 6 & 9 \end{bmatrix}$ is singular, then x is equal to
(a) 3 (b) 3 or 6
(c) 3 or $\frac{3}{2}$ (d) -3 or $\frac{3}{2}$

6. In a Linear Programming Problem:
(a) The constraints are linear, in any objective function.
(b) The constraints and objective function both are linear.
(c) Constraints are linear or quadratic and objective function is linear.
(d) Only one of the constraints or the objective function is linear.

7. Area bounded by the curve $y = x^3$, the x-axis and the abscissa $x = -2$ and $x = 3$ is:
(a) $\frac{97}{4}$ (b) $-\frac{65}{4}$
(c) $\frac{65}{4}$ (d) -97

8. Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} - \hat{j} + 2\hat{k}$, and $\vec{c} = x\hat{i} + (x-2)\hat{j} - \hat{k}$. If the vector $\vec{c}$ lies in the plane of $\vec{a}$ and $\vec{b}$, then x equals
(a) -4 (b) -2
(c) 0 (d) 1

9. If $A = R - \{+1\}$ and funcion $f : A \to A$ is defined by $f(x) = \frac{x+1}{x-1}$, then $f^{-1}(x)$ is given by:
(a) $\frac{1}{x-1}$ (b) $\frac{1}{1-x}$
(c) $\frac{x+1}{1-x}$ (d) $\frac{x+1}{x-1}$

10. The plane $2x - 3y + 6z - 11 = 0$ makes an angle $\sin^{-1}\alpha$ with x- axis. The value of α is equal to:
(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{2}{7}$
(c) $\frac{3}{7}$ (d) $\frac{\sqrt{2}}{3}$

11. Let A and B be two events such that $P(A) = \frac{3}{8}$, $P(B) = \frac{5}{8}$ and $P(A \cup B) = \frac{3}{4}$. Which of the following is correct?

A. $P(A|B)$ is $\frac{2}{5}$

B. $P(A'|B)$ is $\frac{4}{5}$

C. $P(A|B).P(A'|B)$ is $\frac{8}{25}$

D. $P(B'|A)$ is $\frac{1}{3}$

Choose the correct answer from the options given below:
(a) B and C only (b) B and D only
(c) A and D only (d) A and C only

12. Area bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$ is:
(a) $\frac{16}{3}$ (b) 16
(c) $\frac{8}{3}$ (d) $\frac{32}{3}$

13. The derivative of $\sin^3(\cos x^2)$ with respect to x is:
(a) $-6x\sin^2(\cos x^2)\sin x^2$
(b) $-6x\sin^2(\cos x^2)\sin x$
(c) $-6x\sin^3(\cos x^2)\sin x^2$
(d) $-6x\sin^3(\cos x^2)$

14. $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1}{1+\sqrt{\cot x}}\,dx$ is equal to:
(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$
(c) $\frac{\pi}{12}$ (d) $\frac{\pi}{2}$

15. The order and degree of the differential equation $\sqrt{\sin x}\,(dx+dy)=\sqrt{\cos x}\,(dx-dy)$ is:
(a) 2, 1 (b) 2, 2
(c) 1, 2 (d) 1, 1

16. If $x=a\cos\theta$, $y=b\sin\theta$, then $\frac{d^2y}{dx^2}$ at $\theta=\frac{\pi}{2}$ is:
(a) $-\frac{b}{a}$ (b) $-\frac{b}{a^2}$
(c) $\frac{a}{b}$ (d) $\frac{a}{b^2}$

17. Match List-I with List-II

List-I	List-II
A. $f:R\to R, f(x)=[x]$	I. Signum function
B. $f:R\to R, f(x)=\lvert x\rvert$	II. Identity function
C. $f:R\to R, f(x)=x$	III. Greatest Integer function
D. $f:R\to R, f(x)=\begin{cases}-1 & \text{if } x<0\\ 0 & \text{if } x=0\\ 1 & \text{if } x>0\end{cases}$	IV. Modulus function

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

18. If $A=\begin{bmatrix}2+x & y\\ 1 & 5\end{bmatrix}$ and $B=\begin{bmatrix}3+y & x-1\\ 2 & 10\end{bmatrix}$ such that $B=2A$, then values of x and y are respectively:
(a) 1, 1 (b) 1, –1
(c) –1, –1 (d) –1, 1

19. If the matrix $A=\begin{bmatrix}0 & 2 & c\\ a & b & 1\\ -3 & -1 & 0\end{bmatrix}$ is a skew-symmetric matrix, then $a+b+c$ is equal to:
(a) –5 (b) 5
(c) 1 (d) –1

20. Match the following elements of $\begin{bmatrix}1 & -1 & 0\\ 0 & 4 & 2\\ 3 & -4 & 6\end{bmatrix}$ with their co-factors.

List-I	List-II
A. 6	I. 6
B. 3	II. 1
C. 2	III. 4
D. –1	IV. –2

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

21. Rolle's theorem holds for the function $f(x)=x^3+\alpha x^2+\beta x$, $1\le x\le 2$ at the point $\frac{4}{3}$, the values of α and β are:
(a) $\alpha=5, \beta=-8$ (b) $\alpha=-5, \beta=-8$
(c) $\alpha=8, \beta=-5$ (d) $\alpha=-5, \beta=8$

22. If A is square matrix of order 3 and $B=-2A$ such that $|B|=k|A|$ then the value of k is
(a) 8 (b) 4
(c) 16 (d) –8

23. If A is a $m\times n$ matrix and B is $n\times p$ matrix and $m\neq p$ then,
(a) $(AB)'=B'A'$ (b) $(BA)'=A'B'$
(c) $(AB)'=A'B'$ (d) $(BA)'=B'A'$

24. If $3\tan^{-1}x+\cot^{-1}x=\pi$, then x equals to:
(a) –1 (b) 1
(c) $\frac{1}{2}$ (d) 0

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

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

27. If $f(x)=\begin{cases}\frac{\sqrt{x^2+5}-3}{x+2}, & x\neq -2\\ k, & x=-2\end{cases}$ is continuous at $x=-2$ then the value of k is :

(a) $-\frac{2}{3}$ (b) 0

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

28. Given equation of line $\frac{x-1}{3}=\frac{y+2}{4}=\frac{z-3}{-2}$ and equation of a plane $2x-y+3z=1$. Which of the following is correct?

(A) Given line and plane intersect at (10,10,–3).
(B) The line passes through the point (–1, 2, –3).
(C) Direction ratio's of normal to the plane are –2, –1, –3.
(D) The line is parallel to the vector $3\hat{i}+4\hat{j}-2\hat{k}$.

Choose the correct answer from the options given below:
(a) A and C only (b) A and D only
(c) B and D only (d) C and D only

29. If $\vec{a}$ and $\vec{b}$ are two non-zero vectors, then which of the following is correct?

A. $\vec{a}\times\vec{b}=\vec{0}$ if and only if $\vec{a}$ is perpendicular to $\vec{b}$.

B. $\vec{a}\times\vec{b}$ is vector.

C. $\vec{a}\times\vec{b}=|\vec{a}||\vec{b}|\cos\theta\hat{n}$

D. If $\theta=\frac{\pi}{2}, |\vec{a}\times\vec{b}|=|\vec{a}||\vec{b}|$

Choose the correct answer from the options given below:
(a) A and B only (b) A and D only
(c) B and C only (d) B and D only

30. Match List I with List II

List I	List II
A. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}}\sin^7 x\,dx$	I. π
B. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}}(x\cos x+1)\,dx$	II. $\frac{\pi}{12}$
C. $\int_0^{\frac{\pi}{2}}\frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}dx$	III. 0
D. $\int_1^{\sqrt{3}}\frac{dx}{1+x^2}$	IV. $\frac{\pi}{4}$

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

31. If $\tan^{-1}\left(\frac{1-x}{1+x}\right)=\frac{1}{2}\tan^{-1}x, (x>0)$, then value of x is:

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

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

32. The minimum value of $x\log_e x$ is equal to

(a) e (b) $\frac{1}{e}$

(c) $-\frac{1}{e}$ (d) 2e

33. The area of the region $\{(x,y): x^2+y^2\le 1\le x+y\}$ is:

(a) $\left(\frac{\pi}{4}-\frac{1}{2}\right)$ (b) $\left(\frac{\pi}{4}+\frac{1}{2}\right)$

(c) $\left(\frac{\pi}{2}-\frac{1}{2}\right)$ (d) $\left(\frac{\pi}{2}+\frac{1}{2}\right)$

34. The area of the parallelogram whose adjacent sides are determined by the vectors $\vec{a}=\hat{i}-\hat{j}+3\hat{k}$ and $\vec{b}=2\hat{i}-7\hat{j}+\hat{k}$ is:

(a) $2\sqrt{5}$ (b) 15

(c) $15\sqrt{2}$ (d) 2

35. The equation of the plane passing through the point (–1, 3, 2) and perpendicular to each of the planes $x+2y+3z=5$ and $3x+3y+z=0$ is:

(a) $7x+8y-3z+25=0$
(b) $7x-8y+3z-25=0$
(c) $7x+8y-3z-25=0$
(d) $7x-8y+3z+25=0$