CUET UG – 2022

Mathematics/Applied Mathematics

Question : 1

The function $f: R - \{-1\} \to R$ defined as $f(x) = \frac{x-1}{x+1}$ is increasing in the interval:

A $(0, \infty)$

B $(-1, \infty)$

C $(-\infty, 0)$

D $(-\infty, \infty) - \{-1\}$

Question : 2

If A and B are two independent events with $P(A) = \frac{3}{5}$ and $P(B) = \frac{4}{9}$, then $P(A' \cap B')$ is equal to:

A $\frac{4}{15}$

B $\frac{1}{5}$

C $\frac{1}{3}$

D $\frac{2}{9}$

Question : 3

The range of function $f(x) = x^2 - 2x + 2; x \in R$ is:

A $[1, \infty)$

B $(0, \infty)$

C $(-\infty, \infty)$

D $[-1, \infty)$

Question : 4

Two cards are randomly drawn from a well shuffled pack of 52 cards without replacement. The mean of, distribution of number of kings, is :

A $\frac{33}{221}$

B $\frac{4}{13}$

C $\frac{1}{13}$

D $\frac{2}{13}$

Question : 5

In an LPP, with the constraints are $x - 3y \geq 0, y \geq 0, 0 \leq x \leq 3$. The feasible region is :

A not lies in the first quadrant.

B bounded and lies in the first quadrant.

C unbounded in the first quadrant.

D an empty set.

Question : 6

The points on the curve $\frac{x^2}{9} + \frac{y^2}{64} = 1$ at which the tangents are parallel to the x-axis are :

A $(0, \pm 3)$

B $(\pm 8, 0)$

C $(0, \pm 8)$

D $(\pm 3, 0)$

Question : 7

If A is a square matrix of order 2×2 and $|A| = 7$, then value of $|2 \text{ Adj. } (A)|$ is:

A 21

B 28

C 14

D 7

Question : 8

The number of all non-zero matrices of order 2×3 with each entry $-1, 0, 1$ is:

A 27

B 243

C 728

D 729

Question : 9

If A is square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to:

A A

B I – A

C I

D 3A

Question : 10

If $y = 3e^{2x} + 2e^{3x}$, then $\frac{d^2y}{dx^2} - 5\frac{dy}{dx}$ is equal to:

A $6y$

B $-6y$

C $5y$

D $-4y$

Question : 11

The sum of order and degree of differential equation

$$2\sqrt{\frac{d^2y}{dx^2}}+\left(\frac{dy}{dx}\right)^3=0$$

is:

A 4

B 3

C 2.5

D 5

Question : 12

The area of the region bounded by the curves $y^2 = x$ and $y = x$ is:

A $\frac{1}{2}$

B $\frac{2}{3}$

C $\frac{1}{6}$

D $\frac{5}{12}$

Question : 13

Let R be the relation on the set {1, 2, 3, 4} defined by R = {(1, 2), (2, 1), (2, 2), (3, 3), (4, 4), (1, 4), (4, 1)}. Then R is:

A Reflexive but not symmetric

B Symmetric but not transitive

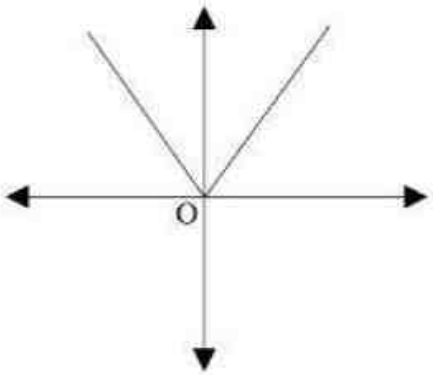
C Transitive but not reflexive

D Equivalence Relation

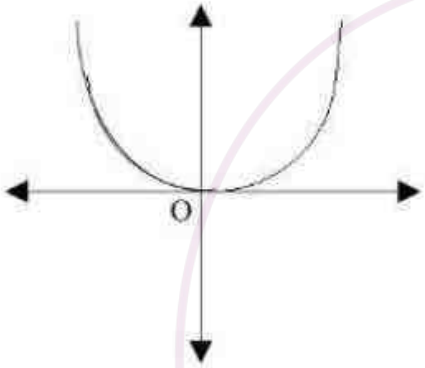
Question : 14

Which of the following graph represent one-one function?

A



B



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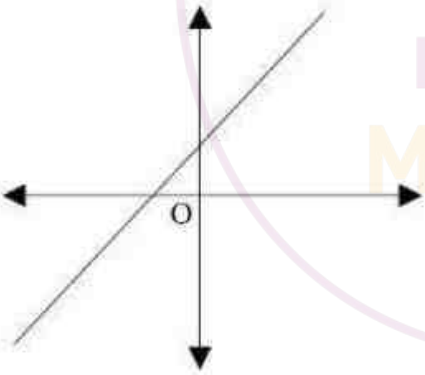

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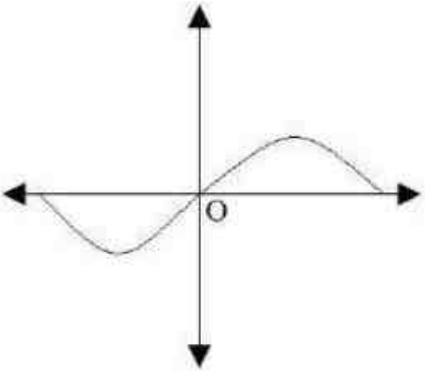


Question : 15

If $A = \begin{bmatrix} 3 & 2 \\ 2 & 1 \end{bmatrix}$ and $A^2 - \lambda A - I = 0$, then the value of λ is:

A 4

B 1

C -4

D -1

Question : 16

The principal value of $\tan^{-1}(-1)$ is:

A $\frac{\pi}{4}$

B $-\frac{\pi}{4}$

C $\frac{3\pi}{4}$

D $-\frac{3\pi}{4}$

Question : 17

$\int_0^{\frac{\pi}{2}} \frac{cos^5 x}{sin^5 x + cos^5 x} dx =$

A π

B $\frac{\pi}{2}$

C $\frac{\pi}{4}$

D 2π

Question : 18

$$\int \frac{x^3 \sin(tan^{-1}x^4)}{1+x^8} dx =$$

A $\frac{1}{4}\cos(tan^{-1}x^4) + C$

B $-\frac{1}{4}\cos(tan^{-1}x^4) + C$

C $4\sin(tan^{-1}x^4) + C$

D $-\frac{1}{4}\sin(tan^{-1}x^4) + C$

Question : 19

$$\sin\left(tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right)\right) =$$

A $\frac{1+x}{2}$

B $\sqrt{1+x}$

C $\sqrt{\frac{1+x}{2}}$

D $\sqrt{\frac{1-x}{2}}$

Question : 20

Match List I with List II

Let R^- be the set of all positive real numbers:

List I	List II
A. $f: R^- \to R, f(x) = x^2$	I. One-one and onto
B. $f: R \to R, f(x) = x^4$	II. One-one but not onto
C. $f: R \to R, f(x) = x$	III. Neither one-one, nor onto
D. $f: R \to R^-, f(x) = x^2$	IV. Not one-one but onto

Choose the correct answer from the options given below:

A A-III, B-II, C-I, D-IV

B A-I, B-II, C-III, D-IV

C A-II, B-III, C-I, D-IV

D A-IV, B-I, C-III, D-II

Question : 21

If $P = \begin{bmatrix} 2 & -1 & 3 \\ -4 & 5 & 1 \end{bmatrix}$ and $Q = \begin{bmatrix} 2 & 3 \\ 4 & -2 \\ 1 & 5 \end{bmatrix}$, then:

A. PQ is defined and it is 2×2 matrix.
B. QP is not defined.
C. PQ is not defined while QP is defined and 2×2 matrix.
D. QP is defined and it is 3×3 matrix.

Choose the correct answer from the options given below:

A A, B only

B C only

C A, D only

D B only

Question : 22

Let $A=[aij]_{2\times2}$ where $a_{ij}=\begin{cases}1, & i\neq j\\ -1, & i=j\end{cases}$ then:

A $A^9=256\,A$

B $A^6=-16\,A$

C $A^9=-64\,A$

D $A^6=32\,A$

Question : 23

If $A=\begin{bmatrix}0 & a & 8\\ 5 & 0 & b\\ c & -12 & 0\end{bmatrix}$ is a skew symmetric matrix then value of $a+b+c$. is :

A -9

B 1

C 15

D -1

Question : 24

If P is matrix of order 3 with $|P|=-2$, then $|-5P^{-1}|$ is equal to:

A $-\frac{5}{2}$

B $\frac{125}{2}$

C $\frac{5}{2}$

D $-\frac{125}{2}$

Question : 25

If the function $f(x) = \begin{cases} \frac{e^{2x}-1}{x}, & x \neq 0 \\ \frac{k}{2}, & x = 0 \end{cases}$ is continuous at $x = 0$, then the value of k is equal to:

A 2

B 3

C 6

D 12

Question : 26

The function $f(x) = log_e(x) - 2\left(\frac{x-1}{x+1}\right); x > 0$ is:

A strictly increasing in $(0, \infty)$

B strictly decreasing in $(0, 1)$

C There exists $x_0, x_1 \in (0, \infty), x_0 \neq x_1$ such that $f(x_0) = f(x_1) = -1$

D $f''(1) = 2$

Question : 27

$\int_{\frac{1}{2}}^{1} \frac{\sqrt{x-x^2}}{x^2} dx =$

A $\frac{3}{2}$

B $\frac{1}{3}\left(2 - \frac{1}{\sqrt{2}}\right)$

C $\frac{\sqrt{2}}{3}$

D $\frac{2}{3}$

Question : 28

The solution of the following differential equation $y\,dx - (x + 2y^2)dy = 0, y > 0$ is:

A $x = 2y^2 + Cy$

B $y = 2x^2 + Cx$

C $xy = x^2 + Cy$

D $x = y^2 + Cy$

Question : 29

Let P be the plane passing through the point (1, 2, 3) and perpendicular to the line $\frac{x-2}{1} = \frac{y-3}{-1} = \frac{z-4}{2}$. Then the distance of the point (3, −2, −3) from the plane P is:

A $\frac{4}{\sqrt{6}}$

B $\sqrt{6}$

C $\frac{1}{\sqrt{6}}$

D 6

Question : 30

Equation of the plane that contains the line $\frac{x-1}{1} = \frac{y+1}{2} = \frac{z-1}{1}$ and perpendicular to the plane $3x - y - z + 7 = 0$ is:

A $2x - y - z + 1 = 0$

B $4x - y - 2z + 3 = 0$

C $x - 4y + 7z - 12 = 0$

D $x + 4y - 7z + 10 = 0$

Question : 31

For two events A and B with $P(A)=\frac{1}{2}$, $P(B)=\frac{1}{3}$, $P(A\cap B)=\frac{1}{4}$ and $P(A'\cap B')$ is equal to:

A $\frac{7}{12}$

B $\frac{5}{6}$

C $\frac{5}{12}$

D $\frac{3}{4}$

Question : 32

When 3 coins are tossed simultaneously, the probability of having at most 3 heads is:

A 0

B 1

C $\frac{7}{8}$

D $\frac{1}{8}$

Question : 33

A box has 20 paper slips having a number from 1-20 written on it. One slip is chosen at random from the box. The probability that the chosen slip has a composite number on it, is:

A $\frac{2}{5}$

B $\frac{3}{5}$

C $\frac{11}{20}$

D $\frac{1}{2}$

Question : 34

If the random variable X has the following probability distribution:

x	−1	0	1	2
$P(X=x)$	k	2k	3k	$\frac{k}{2}$

then $P(X \leq 0)$ is equal to:

A $\frac{6}{13}$

B $\frac{4}{13}$

C $\frac{2}{13}$

D $\frac{3}{7}$

Question : 35

If A is non singular matrix of order 3, then which of the following is not correct :

A $(aA)^{-1} = \frac{1}{a}A^{-1}, a \neq 0$

B $|A^{-1}| = |A|^{-1}$

C $(A^3)^{-1} = (A^{-1})^3$

D $Adj.(A) = |A|^2$

Question : 36

A fair die is thrown. If E is the event that 'the number appearing is a multiple of 3' and F be the event that 'the number appearing is even'. Then choose the correct option given below:

A $P(F) = \frac{1}{3}$

B $P(E \cup F) = \frac{1}{2}$

C E and F are mutually disjoint events.

D E and F are independent events.

Question : 37

A line $y = x$ partitions the circle $(x-a)^2 + y^2 = a^2, a > 0$ in two parts. The area of the major segment is:

A $\frac{3\pi a^2}{4}$

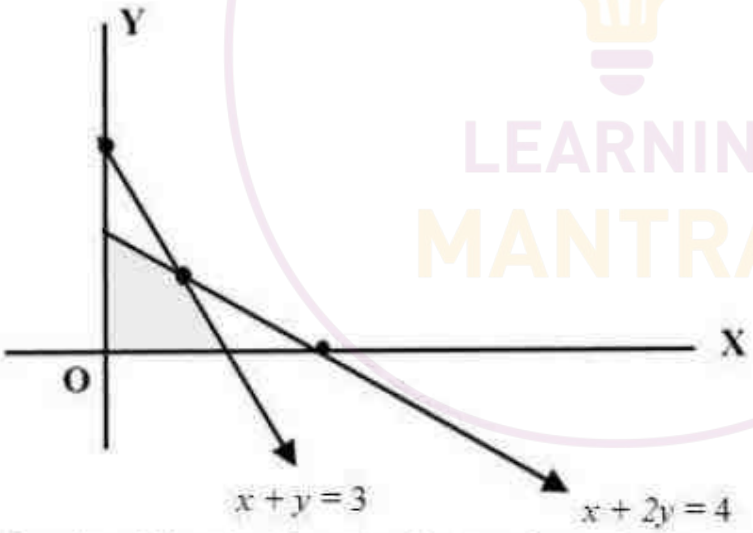
B $\frac{a^2}{4}(4\pi - 1)$

C $\frac{a^2}{4}(\pi + 3)$

D $\frac{a^2}{4}(3\pi + 2)$

Question : 38

The feasible region for LPP is the shaded region in the figure below.



Let the objective function be z = 3x + 4y, then maximum value of z is :

A 8

B 10

C 9

D 17

Question : 39

A businessman deals with two items X and Y. He has storage for almost 200 items. He needs to setup the business with a minimum capital of ₹ 50000. Items X and Y cost ₹ 1000 and ₹ 2000 each respectively. There should be at least 20 items of type X where quantity of item Y must not exceed three times the quantity of item X available. The constraints of the LPP corresponding to the above situation are represented by:

A. $x + y \leq 200$
B. $3x - y \geq 0$
C. $x + 2y \leq 50$
D. $x \leq 20$
E. $y \geq 20$

Choose the correct answer from the options given below:

A A and B only

B A, B and C only

C A, B, C and D only

D A, C and E only

Question : 40

The optimal value of the LPP $\max(z) = x + 2y$ subject to constraints

$x + 3y \leq 30$
$x - 5y \leq -30$
$x \geq 0$
$y \geq 0$

is:

A 22

B 30

C 22.5

D 20

Passage:
Kavya on her birthday decided to donate some money to children of an orphanage home. If there were 8 children less, everyone would have got ₹ 10 more. However, if there were 16 children more, everyone would have got ₹ 10 less. Let the number of children be x and the amount distributed by Kavya for one child be ₹ y.
Based on the above information, answer the question :

Question : 41
The equations in terms x and y are:

A $5x + 4y = 40;\ 5x + 8y = 80$

B $5x - 4y = 40;\ 5x - 8y = -80$

C $5x - 4y = 40;\ 5x + 8y = -80$

D $5x + 4y = 40;\ 5x - 8y = 80$

Question : 42
The conditions given the problem can be represented by :

A $\begin{bmatrix} 5 & -4 \\ 5 & -8 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 40 \\ -80 \end{bmatrix}$

B $\begin{bmatrix} 5 & 4 \\ 5 & -8 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 40 \\ -80 \end{bmatrix}$

C $\begin{bmatrix} 5 & -4 \\ 5 & -8 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 40 \\ 80 \end{bmatrix}$

D $\begin{bmatrix} 5 & -4 \\ 5 & -8 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -40 \\ -80 \end{bmatrix}$

Question : 43
The number of children who were given some money by Kavya, is:

A 30

B 32

C 28

D 40

Question : 44

The amount (in Rs.) given to each child by Kavya is:

A 30

B 26

C 32

D 60

Question : 45

The amount (in ₹), Kavya distributed to the children in the orphanage is:

A 609

B 690

C 906

D 960

Passage:

The floor of the banquet hall in a hotel is made of polished stone. There is a large chandelier attached to the ceiling of the hall. Consider floor of the hotel as a plane having the equation $x - y + z = 4$ and chandelier is suspended at the point (1, 0, 1) from the wall.

On the basis of above information, answer the following questions.

Question : 46

The direction ratios of the perpendicular from the point (1, 0, 1) to the plane $x - y + z = 4$

A (-1, -1, 1)

B (1, 1, -1)

C (1, -1, 1)

D (1, -1, -1)

Question : 47

The length of the perpendicular from the point (1, 0, 1) to the plane $x - y + z = 4$ is

A 1

B $\frac{2}{\sqrt{3}}$

C $\frac{1}{\sqrt{3}}$

D 2

Question : 48

The equation of the plane in the banquet hall parallel to the $x - y + z = 4$, and at a unit distance from the point (1, 0, 1), is :

A $x - y + z = 6 + \sqrt{3}$

B $x - y + z = 2 - \sqrt{3}$

C $x - 2y + z = 4$

D $x - y + z = 4 - \sqrt{3}$

Question : 49

The equation of the perpendicular from the point (1, 0, 1) to the plane $x - y + z = 4$ is:

A $\frac{x}{1} = \frac{y-1}{1} = \frac{z-1}{-1}$

B $\frac{x-1}{1} = \frac{y}{-1} = \frac{1-z}{-1}$

C $\frac{x-1}{-1} = \frac{y-1}{1} = \frac{z}{1}$

D $\frac{x-1}{1} = \frac{y}{-1} = \frac{1-z}{1}$

Question : 50

The direction cosine of the normal to the plane $x - y + z = 4$ are:

A $\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$

B $-\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$

C $\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}$

D $-\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}$