Studentpad

K-CET MATHEMATICS PAPER 2022-23

Time : 120 Min	Maths : Full Portion Paper	Marks : 60

01) The standard deviation of a distribution divided by the mean of the distribution and expressing in percentage is known as
A) coefficient of quartile deviation
B) coefficient of skewness
C) coefficient of standard deviation
D) coefficient of variation

02) Estimate the value of $\sin 12^o \sin 48^o \sin 54^o$.
A) $\frac{1}{32}$
B) $\frac{1}{16}$
C) $\frac{1}{8}$
D) $\frac{1}{4}$

03) The number of solutions of equations
$x + y - z = 0$, $3x - y - z = 0$, $x - 3y + z = 0$ is
A) 2
B) 1
C) 0
D) Infinite

04) If $\sin\theta + \sin 2\theta + \sin 3\theta = \sin\alpha$ and $\cos\theta + \cos 2\theta + \cos 3\theta = \cos\alpha$, then θ is equal to
A) α
B) 2α
C) $\alpha / 6$
D) $\alpha / 2$

05) A 2 m ladder leans against a vertical wall. If the top of the ladder begins to slide down the wall at the rate 25 cm/s, then determine the rate (in cm/s) at which the bottom of the ladder slides away from the wall on the horizontal ground when the top of the ladder is 1 m above the ground.
A) 25
B) $\frac{25}{\sqrt{3}}$
C) $\frac{25}{3}$
D) $25\sqrt{3}$

06) The four arithmetic means between 3 and 23 are
A) 7, 15, 19, 21
B) 7, 11, 15, 19
C) 5, 11, 15, 22
D) 5, 9, 11, 13

07) $\left(\int_0^a x\,dx\right) \le (a+4)$, then
A) $a \le -2$ or $a \ge 4$
B) $-2 \le a \le 0$
C) $-2 \le a \le 4$
D) $0 \le a \le 4$

08) If S.D. of first n natural numbers is $\sqrt{2}$, then what must be the value of n?
A) 7
B) 4
C) 6
D) 5

09) Let f(x) be differentiable on the interval $(0,\infty)$ such that $f(1)=1$, and $\lim_{t\to x}\frac{t^2 f(x) - x^2 f(t)}{t-x} = 1$ for each $x > 0$. Then, find f(x).
A) $\frac{1}{3x} + \frac{2x^2}{3}$
B) $-\frac{1}{3x} + \frac{4x^2}{3}$
C) $\frac{1}{x}$
D) $-\frac{1}{x} + \frac{2}{x^2}$

10) If $\tan^{-1}(x-1) + \tan^{-1}x + \tan^{-1}(x+1) = \tan^{-1}3x$, then x =
A) $0, \frac{1}{2}$
B) $\pm\frac{1}{2}$
C) $0, \pm\frac{1}{2}$
D) $0, -\frac{1}{2}$

11) If matrix $A = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$, then
A) $A.\begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix} = 2I$
B) $A' = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$
C) $A^{-1} = \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$

D) $\lambda A = \begin{bmatrix} \lambda & -\lambda \\ 1 & -1 \end{bmatrix}$ where λ is a non zero scalar

12) A function f from the set of natural numbers to integers defined by

$$f(n) = \begin{cases} \frac{n-1}{2}, \text{when n is odd.} \\ -\frac{n}{2}, \text{when n is even.} \end{cases}, \text{ is}$$

A) onto but not one-one.
B) one-one but not onto.
C) one-one and onto both.
D) neither one-one nor onto

13) If $\cos^{-1}\sqrt{p} + \cos^{-1}\sqrt{1-p} + \cos^{-1}\sqrt{1-q} = \frac{3\pi}{4}$, then what is the value of q?

A) $\frac{1}{\sqrt{2}}$
B) 1
C) $\frac{1}{3}$
D) $\frac{1}{2}$

14) If $1 + \cos\alpha + \cos^2\alpha + \ldots\ldots\infty = 2 - \sqrt{2}$, then α, $(0 < \alpha < \pi)$ is

A) $\pi/4$
B) $3\pi/4$
C) $\pi/6$
D) $\pi/8$

15) If the area bounded by $y = ax^2$ and $x = ay^2$, $a > 0$, is 1, then $a =$

A) $\frac{1}{\sqrt{3}}$
B) $\frac{1}{3}$
C) 1
D) None of these

16) If $x = \operatorname{cosec}\theta - \sin\theta, y = \operatorname{cosec}^n\theta - \sin^n\theta$, then $\left(x^2+4\right)\left(\frac{dy}{dx}\right)^2 - n^2y^2$ equal to

A) n^2
B) $3n^2$
C) $2n^2$
D) $4n^2$

17) What is the value of k so that the function

$$f(x) = \begin{cases} \frac{x^4-256}{x-4}, & x \neq 4 \\ k, & x = 4 \end{cases}$$ is continuous at x=4?

A) 64
B) 128
C) 256
D) None of these

18) P,Q,R and S are four coplanar points on the sides AB, BC, CD and DA of a skew quadrilateral. The product $\frac{AP}{PB}\cdot\frac{BQ}{QC}\cdot\frac{CR}{RD}\cdot\frac{DS}{SA} = ?$

A) -2
B) 2
C) -1
D) 1

19) The distance between the line $r = 2i - 2j + 3k + \lambda(i - j + 4k)$ and the plane $r.(i+5j+k) = 5$ is

A) $\frac{10}{3\sqrt{3}}$
B) $\frac{10}{9}$
C) $\frac{10}{3}$
D) $\frac{3}{10}$

20) The general solution of the differential equation $(x+y)dx + xdy = 0$ is

A) $y^2 + 2xy = c$
B) $x^2 + 2xy = c$
C) $2x^2 - y^2 = c$
D) $x^2 + y^2 = c$

21) If $f(x) = x(\sqrt{x} - \sqrt{x+1})$, then

A) $f(x)$ is differentiable at $x = 0$.
B) $f(x)$ is continuous but non-differentiable at $x = 0$.
C) $f(x)$ is not differentiable at $x = 0$.
D) None of these.

22) The sufficient conditions for the function $f: R \to R$ is to be maximum at $x = a$, will be

A) $f'(a) > 0$ and $f''(a) < 0$
B) $f'(a) = 0$ and $f''(a) < 0$
C) $f'(a) = 0$ and $f''(a) = 0$
D) $f'(a) > 0$ and $f''(a) > 0$

23) The corner points of the feasible region are (800, 400), (1050, 150), (600, 0). The objective function is $P = 12x + 6y$. The maximum value of P is

A) 7200
B) 12000
C) 13500
D) 16000

24) $\begin{vmatrix} b^2+c^2 & a^2 & a^2 \\ b^2 & c^2+a^2 & b^2 \\ c^2 & c^2 & a^2+b^2 \end{vmatrix} =$

A) $a^2b^2c^2$
B) $4a^2b^2c^2$
C) $4abc$
D) abc

25) The points with position vectors $60\hat{i}+3\hat{j},\ 40\hat{i}-8\hat{j},\ \ a\hat{i}-52\hat{j}$ are collinear, if a = ____
A) -40
B) 20
C) 40
D) None of these

26) Probability of solving specific problem independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$, respectively. If both try to solve the problem independently, find the probability of
(i) the problem is solved
(ii) exactly one of them solves the problem
A) $\frac{1}{4}$ and $\frac{3}{4}$
B) $\frac{2}{3}$ and $\frac{1}{2}$
C) $\frac{1}{2}$ and $\frac{2}{3}$
D) None of these

27) The maximum value of $x^{1/x}$ is
A) e
B) $e^{1/e}$
C) $\frac{1}{e}$
D) $\frac{1}{e^e}$

28) Distance between two parallel planes $2x+y+2z=8$ and $4x+2y+4z+5=0$ is
A) $\frac{3}{2}$
B) $\frac{5}{2}$
C) $\frac{7}{2}$
D) $\frac{9}{2}$

29) If $y=\sin x \sin 3x$, then $y_n =$
A) $\frac{1}{2}\left[2^n \cos\left(2x+n\frac{\pi}{2}\right)-4^n\cos\left(4x+n\frac{\pi}{2}\right)\right]$
B) $\frac{1}{2}\left[\cos\left(2x+n\frac{\pi}{2}\right)-\cos\left(4x+n\frac{\pi}{2}\right)\right]$
C) $\frac{1}{2}\left[4^n \cos\left(4x+n\frac{\pi}{2}\right)-2^n\cos\left(2x+n\frac{\pi}{2}\right)\right]$
D) None of these

30) The area bounded by the curves y=f(x), the x-axis, and the ordinates x=1 and x=b is (b-1)sin (3b+4). Then what is f(x)?
A) $\sin(3x+4)$
B) $(x-1)\cos(3x+4)$
C) $\sin(3x+4)+3(x-1)\cos(3x+4)$
D) None of these

31) $\lim_{n\to\infty}(3^n+4^n)^{\frac{1}{n}} =$
A) 4
B) 3
C) e
D) ∞

32) If A is square matrix such that $A^2=A$, then $(A+I)^3$?
A) $A+1$
B) $7A+1$
C) $A-1$
D) $3A+1$

33) There are two values of a which makes determinant, $\Delta=\begin{vmatrix} 1 & -2 & 5 \\ 2 & a & -1 \\ 0 & 4 & 2a \end{vmatrix}=86$, then what is the sum of these number?
A) 7
B) 3
C) -4
D) 4

34) A plane which bisects the angle between the two given planes $2x-y+2z-4=0$ and $x+2y+2z-2=0$, passes through which one of the following point?
A) $(2,4,1)$
B) $(1,4,-1)$
C) $(1,-4,1)$
D) $(2,-4,1)$

35) $\int_0^{\pi/4}\tan^2 x\,dx =$
A) $\frac{\pi}{4}$
B) $\frac{\pi}{4}-1$
C) $1+\frac{\pi}{4}$
D) $1-\frac{\pi}{4}$

36) The equation of straight line passing through $(-a, 0)$ and making the triangle with axes of area 'T' is

A) $2Tx - a^2y + 2aT = 0$

B) $2Tx + a^2y + 2aT = 0$

C) $2Tx - a^2y - 2aT = 0$

D) None of these

37) Let A and B be points with position vectors a and b with respect to the origin O. If the point C on OA is such that $2AC = CO$, CD is parallel to OB and $|\overrightarrow{CD}| = 3|\overrightarrow{OB}|$, then $\overrightarrow{AD}$ is equal to

A) $3b + \frac{a}{3}$

B) $3b - \frac{a}{3}$

C) $3b + \frac{a}{2}$

D) $3b - \frac{a}{2}$

38) The left-hand derivative of $f(x) = [x]\sin(\pi x)$ at x = k, k is an integer and $[x]$ = greatest integer $\le x$, is

A) $(-1)^k k\pi$

B) $(-1)^{k-1} k\pi$

C) $(-1)^{k-1}(k-1)\pi$

D) $(-1)^k (k-1)\pi$

39) Suppose $f(x)$ is differentiable at $x = 1$ and $\lim_{h\to 0}\frac{1}{h}f(1+h) = 5$, then $f'(1)$ equals

A) 3
B) 4
C) 5
D) 6

40) At a certain conference of 100 people, there are 29 Indian women and 23 Indian men. Of these Indian people 4 are doctors and 24 are either men or doctors. These are no foreign doctors. Calculate how many foreigners and women doctors are attending the conference?

A) 48,1
B) 34,3
C) 42,2
D) 46,4

41) Three boys and two girls stand in a queue. What is the probability that the number of boys ahead of every girl is atlest one more that the number of girls ahead of her?

A) 1/2
B) 1/3
C) 3/4
D) 2/3

42) Range of the function $f(x) = \frac{x^2 + x + 2}{x^2 + x + 1}; x \in R$ is

A) $(1, 7/5]$

B) $(1, 7/3]$

C) $(1, 11/7]$

D) $(1, \infty)$

43) If $A = [-3, 7]$ and $B = [2, 9]$ then which of the following is false?

A) $A \cap B = [2, 7]$

B) $A - B' = [2, 7]$

C) $A - B = [-3, 2]$

D) $(A \cup B)' = (-\infty, -3) \cup (9, \infty)$

44) If α, β are the roots of the equation $x^2 - (1+n^2)x + \frac{1}{2}(1+n^2+n^4) = 0$, then the value of $\alpha^2 + \beta^2$ is

A) n^3

B) n^2

C) $2n^2$

D) $2n$

45) $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}; I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$A^{-1} = \frac{1}{6}[A^2 + cA + dI]$, where $c, d \in R$, then pair of values (c, d)

A) (-6, -11)
B) (-6, 11)
C) (6, -11)
D) (6, 11)

46) The straight line $x + y = 0$, $3x + y - 4 = 0$ and $x + 3y - 4 = 0$ form a triangle. The triangle is

A) isosceles
B) right angled
C) equilateral
D) none of the above

47) Consider a class of 5 girls and 7 boys. What is the number of different teams consisting of 2 girls and 3 boys that can be formed from this class, if there are two specific boys A and B, who refuse to be the members of the same team?

A) 500
B) 350
C) 200
D) 300

48) Area bounded by the curve $y = xe^{x^2}$, x-axis and the ordinates $x = 0$, $x = a$ is

A) $e^{a^2} - 1$ sq. unit

B) $e^{a^2} + 1$ sq. unit

C) $\frac{e^{a^2}-1}{2}$ sq. unit

D) $\frac{e^{a^2}+1}{2}$ sq. unit

49) The solution of differential equation $\frac{dy}{dx}+\sin^2 y=0$ is

A) $y=\cot x+c$

B) $x=\cot y+c$

C) $y-2\sin y=c$

D) $y+2\cos y=c$

50) If $(1+x)^n=C_0+C_1x+C_2x^2+.....+C_nx^n$, then the value of $C_0-C_2+C_4-C_6+.....$ is

A) $2^{n/2}\cos\frac{n\pi}{4}$

B) $2^n\sin\frac{n\pi}{2}$

C) $2^n\cos\frac{n\pi}{2}$

D) 2^n

51) The solution of a problem to maximize the objective function $z=x+2y$ under the constraints $x-y\le 2$, $x+y\le 4$ and $x, y\ge 0$, is

A) $x=0, y=3, z=6$

B) $x=1, y=4, z=9$

C) $x=1, y=2, z=5$

D) $x=0, y=4, z=8$

52) A function $f(x)=\begin{cases}1+x, & x\le 2\\ 5-x, & x>2\end{cases}$ is

A) continuous but not differentiable at $x=2$.

B) not continuous at $x=2$.

C) differentiable at $x=2$.

D) none of these.

53) Suppose f is such that $f(-x)=-f(x)$ for every real x and $\int_0^1 f(x)\,dx=5$, then $\int_{-1}^0 f(t)\,dt=$

A) - 5

B) 0

C) 5

D) 10

54) If $f:R\to S$ defined by $f(x)=\sin x-\sqrt{3}\cos x+1$ is onto, then the interval of S is

A) [0, -1]

B) [-1, 3]

C) [0, 1]

D) [1, 1]

55) $\int_0^1 \frac{d}{dx}\left[\sin^{-1}\left(\frac{2x}{1+x^2}\right)\right]dx$ is equal to

A) 0

B) $\pi/4$

C) $\pi/2$

D) π

56) The value of $\int_{-\pi/2}^{\pi/2}(3\sin x+\sin^3 x)\,dx$ is

A) 0

B) 2

C) 3

D) $\frac{10}{3}$

57) ${}^{n-1}C_3+{}^{n-1}C_4>{}^nC_3$, then the value of n is

A) > 7

B) 7

C) < 7

D) None of these

58) The solution of $\frac{d^2y}{dx^2}=\sec^2 x+xe^x$ is

A) $y=\log(\sec x)+(x+2)e^x+c_1x+c_2$

B) $y=\log(\sec x)+(x-2)e^x+c_1x+c_2$

C) $y=\log(\sec x)-(x+2)e^x+c_1x+c_2$

D) None of these

59) The composite mapping fog of the map $f:R\to R$, $f(x)=\sin x$, $g:R\to R$, $g(x)=x^2$ is

A) $(\sin x)^2$

B) $\sin x+x^2$

C) $\sin x^2$

D) $\frac{\sin x}{x^2}$

60) For every value of x function $f(x)=e^x$ is

A) increasing.

B) decreasing.

C) neither increasing nor decreasing.

D) none of these.