KCET Test–2024

PYQ

Mathematics

1. Two finite sets have m and n elements respectively. The total number of subsets of the first set is 56 more than the total number of subsets of the second set. The values of m and n respectively are

(A) 7,6

(B) 5,1

(C) 6,3

(D) 8,7

2. If $[x]^2 - 5[x] + 6 = 0$, where $[x]$ denotes the greatest integer function, then

(A) $x \in [3,4]$

(B) $x \in [2,4)$

(C) $x \in [2,3]$

(D) $x \in (2,3]$

3. If in two circles, arcs of the same length subtend angles 30° and 78° at the centre, then the ratio of their radii is

(A) $\frac{5}{13}$

(B) $\frac{13}{5}$

(C) $\frac{13}{4}$

(D) $\frac{4}{13}$

4. If ΔABC is right angled at C, then the value of $\tan A + \tan B$ is

(A) $a + b$

(B) $\frac{a^2}{bc}$

(C) $\frac{c^2}{ab}$

(D) $\frac{b^2}{ac}$

5. The real value of 'α' for which $\frac{1 - i\sin\alpha}{1 + 2i\sin\alpha}$ is purely real is

(A) $(n+1)\frac{\pi}{2}, n \in N$

(B) $(2n+1)\frac{\pi}{2}, n \in N$

(C) $n\pi, n \in N$

(D) $(2n-1)\frac{\pi}{2}, n \in N$

6. The length of a rectangle is five times the breadth. If the minimum perimeter of the rectangle is 180 cm, then

(A) Breadth ≤ 15 cm

(B) Breadth ≥ 15 cm

(C) Length ≤ 15 cm

(D) Length $= 15$ cm

7. The value of ${}^{49}C_3 + {}^{48}C_3 + {}^{47}C_3 + {}^{46}C_3 + {}^{45}C_3 + {}^{45}C_4$ is

(A) ${}^{50}C_4$

(B) ${}^{50}C_3$

(C) ${}^{50}C_2$

(D) ${}^{50}C_1$

8. In the expansion of $(1+x)^n$ $\frac{C_1}{C_0} + 2\frac{C_2}{C_1} + 3\frac{C_3}{2} + \ldots + n\frac{C_n}{C_{n-1}}$ is equal to

(A) $\frac{n(n+1)}{2}$

(B) $\frac{n}{2}$

(C) $\frac{n+1}{2}$

(D) $3n(n+1)$

9. If S_n . stands for sum to n-terms of a G.P. with 'a' as the first term and 'r' as the common ratio then $S_n : S_{2n}$ is

(A) $r^n + 1$

(B) $\frac{1}{r^n + 1}$

(C) $r^n - 1$

(D) $\frac{1}{r^n - 1}$

10. If A.M. and G.M. of roots of a quadratic equation are 5 and 4 respectively, then the quadratic equation is

(A) $x^2 - 10x - 16 = 0$

(B) $x^2 + 10x + 16 = 0$

(C) $x^2 + 10x - 16 = 0$

(D) $x^2 - 10x + 16 = 0$

11. The angle between the line $x + y = 3$ and the line joining the points $(1,1)$ and $(-3,4)$ is

(A) $\tan^{-1}(7)$

(B) $\tan^{-1}\left(-\frac{1}{7}\right)$

(C) $\tan^{-1}\left(\frac{1}{7}\right)$

(D) $\tan^{-1}\left(\frac{2}{7}\right)$

12. The equation of parabola whose focus is $(6,0)$ and directrix is $x = -6$ is

(A) $y^2 = 24x$

(B) $y^2 = -24x$

(C) $x^2 = 24y$

(D) $x^2 = -24y$

13. $\lim_{x \to \frac{\pi}{4}} \frac{\sqrt{2}\cos x - 1}{\cot x - 1}$ is equal to

(A) 2

(B) $\sqrt{2}$

(C) $\frac{1}{2}$

(D) $\frac{1}{\sqrt{2}}$

14. The negation of the statement "For every real number $x; x^2 + 5$ is positive" is

(A) For every real number $x; x^2 + 5$ is not positive

(B) For every real number $x; x^2 + 5$ is negative

(C) There exists at least one real number x such that $x^2 + 5$ is not positive

(D) There exists at least one real number x such that $x^2 + 5$ is positive

15. Let a, b, c, d and e be the observations with mean m and standard deviation S. The standard deviation of the observations $a+k, b+k, c+k, d+k$ and $e+k$ is

(A) kS

(B) $S + k$

(C) $\frac{S}{k}$

(D) S

16. Let $f: R \to R$ be given $f(x) = \tan x$. Then $f^{-1}(1)$ is

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

(B) $\left\{n\pi + \frac{\pi}{4} : n \in Z\right\}$

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

(D) $\left\{n\pi + \frac{\pi}{3} : n \in Z\right\}$

17. Let $f: R \to R$ be defined by $f(x) = x^2 + 1$. Then the pre images of 17 and -3 respectively are

(A) $\phi, \{4, -4\}$

(B) $\{3, -3\}, \phi$

(C) $\{4, -4\}, \phi$

(D) $\{4, -4\}, \{2, -2\}$

18. Let $(gof)(x) = \sin x$ and $(f \circ g)(x) = (\sin\sqrt{x})^2$. Then

(A) $f(x) = \sin^2 x, g(x) = x$

(B) $f(x) = \sin\sqrt{x}, g(x) = \sqrt{x}$

(C) $f(x) = \sin^2 x, g(x) = \sqrt{x}$

(D) $f(x) = \sin\sqrt{x}, g(x) = x^2$

19. Let $A = \{2,3,4,5,\ldots\ldots 16,17,18\}$. Let R be the relation on the set A of ordered pairs of positive integers defined by $(a,b)R(c,d)$ if and only if $ad = bc$ for all $(a,b),(c,d)$ in $A \times A$. Then the number of ordered pairs of the equivalence class of $(3,2)$ is

(A) 4
(B) 5
(C) 6
(D) 7

20. If $\cos^{-1}x + \cos^{-1}y + \cos^{-1}z = 3\pi$, then $x(y+z) + y(z+x) + z(x+y)$ equals to

(A) 0
(B) 1
(C) 6
(D) 12

21. If $2\sin^{-1}x - 3\cos^{-1}x = 4, x \in [-1,1]$ then $2\sin^{-1}x + 3\cos^{-1}x$ is equal to

(A) $\frac{4-6\pi}{5}$
(B) $\frac{6\pi-4}{5}$
(C) $\frac{3\pi}{2}$
(D) 0

22. If A is a square matrix such that $A^2 = A$, then $(I+A)^3$ is equal to

(A) $7A - I$
(B) $7A$
(C) $7A + I$
(D) $I - 7A$

23. If $A = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$, then A^{10} is equal to

(A) $2^8 A$
(B) $2^9 A$
(C) $2^{10} A$
(D) $2^{11} A$

24. If $f(x) = \begin{vmatrix} x-3 & 2x^2-18 & 2x^3-81 \\ x-5 & 2x^2-50 & 4x^3-500 \\ 1 & 2 & 3 \end{vmatrix}$, then $f(1).f(3) + f(3).f(5) + f(5).f(1)$ is

(A) -1
(B) 0
(C) 1
(D) 2

25. If $P = \begin{bmatrix} 1 & \alpha & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 4 \end{bmatrix}$ is the adjoint of a 3×3 matrix A and $|A| = 4$, then α is equal to

(A) 4
(B) 5
(C) 11
(D) 0

26. If $A = \begin{vmatrix} x & 1 \\ 1 & x \end{vmatrix}$ and $B = \begin{vmatrix} x & 1 & 1 \\ 1 & x & 1 \\ 1 & 1 & x \end{vmatrix}$, then $\frac{dB}{dx}$ is

(A) 3 A
(B) -3 B
(C) $3B + 1$
(D) $1 - 3A$

27. Let $f(x) = \begin{vmatrix} \cos x & x & 1 \\ 2\sin x & x & 2x \\ \sin x & x & x \end{vmatrix}$. Then $\lim_{x \to 0} \frac{f(x)}{x^2} =$

(A) -1
(B) 0
(C) 3
(D) 2

28. Which one of the following observations is correct for the features of logarithm function to any base $b > 1$?

(A) The domain of the logarithm function is R, the set of real numbers.
(B) The range of the logarithm function is R^+, the set of all positive real numbers.
(C) The point $(1,0)$ is always on the graph of the logarithm function.
(D) The graph of the logarithm function is decreasing as we move from left to right.

29. The function $f(x)=|\cos x|$ is

(A) Everywhere continuous and differentiable

(B) Everywhere continuous but not differentiable at odd multiples of $\frac{\pi}{2}$

(C) Neither continuous nor differentiable at $(2n+1)\frac{\pi}{2}, n\in Z$

(D) Not differentiable everywhere

30. If $y=2x^{3x}$, then $\frac{dy}{dx}$ at $x=1$ is

(A) 2 (B) 6

(C) 3 (D) 1

31. Let the function satisfy the equation $f(x+y)=f(x)f(y)$ for all $x,y\in R$, where $f(0)\neq 0$. If $f(5)=3$ and $f'(0)=2$, then $f'(5)$ is

(A) 6

(B) 0

(C) 3

(D) -6

32. The value of C in (0, 2) satisfying the mean value theorem for the function. $f(x)=x(x-1)^2, x\in[0,2]$. is equal to

(A) $\frac{3}{4}$ (B) $\frac{4}{3}$

(C) $\frac{1}{3}$ (D) $\frac{2}{3}$

33. $\frac{d}{dx}\left[\cos^2\left(\cot^{-1}\sqrt{\frac{2+x}{2-x}}\right)\right]$ is

(A) $-\frac{3}{4}$

(B) $-\frac{1}{2}$

(C) $\frac{1}{2}$

(D) $\frac{1}{4}$

34. For the function $f(x)=x^3-6x^2+12x-3; x=2$ is

(A) A point of minimum

(B) A point of inflexion

(C) Not a critical point

(D) A point of maximum

35. The function $x^x; x>0$ is strictly increasing at

(A) $\forall x\in R$

(B) $x<\frac{1}{e}$

(C) $x>\frac{1}{e}$

(D) $x<0$

36. The maximum volume of the right circular cone with slant height 6 units is

(A) $4\sqrt{3}\pi$ cubic units

(B) $16\sqrt{3}\pi$ cubic units

(C) $3\sqrt{3}\pi$ cubic units

(D) $6\sqrt{3}\pi$ cubic units

37. If $f(x)=xe^{x(1-x)}$ then $f(x)$ is

(A) Increasing in R

(B) Decreasing in R

(C) Decreasing in $\left[-\frac{1}{2},1\right]$

(D) Increasing in $\left[-\frac{1}{2},1\right]$

38. $\int\frac{\sin x}{3+4\cos^2 x}dx=$

(A) $-\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{2\cos x}{\sqrt{3}}\right)+C$

(B) $\frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{\cos x}{3}\right)+C$

(C) $\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{\cos x}{3}\right)+C$

(D) $-\frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{2\cos x}{3}\right)+C$

39. $\int_{-\pi}^{\pi}(1-x^2)\sin x\cdot\cos^2 x dx =$

(A) $\pi-\frac{\pi^2}{3}$

(B) $2\pi-\pi^3$

(C) $\pi-\frac{\pi^3}{2}$

(D) 0

40. $\int\frac{1}{x\left[6(\log x)^2+7\log x+2\right]}dx =$

(A) $\frac{1}{2}\log\left|\frac{2\log x+1}{3\log x+2}\right|+C$

(B) $\log\left|\frac{2\log x+1}{3\log x+2}\right|+C$

(C) $\log\left|\frac{3\log x+2}{2\log x+1}\right|+C$

(D) $\frac{1}{2}\log\left|\frac{3\log x+2}{2\log x+1}\right|+C$

41. $\int\frac{\sin\frac{5x}{2'}}{\sin\frac{x}{2}}dx =$

(A) $2x+\sin x+2\sin 2x+C$

(B) $x+2\sin x+2\sin 2x+C$

(C) $x+2\sin x+\sin 2x+C$

(D) $2x+\sin x+\sin 2x+C$

42. $\int_1^5(|x-3|+|1-x|)dx =$

(A) 12 (B) $\frac{5}{6}$

(C) 21 (D) 10

43. $\lim_{n\to\infty}\left(\frac{n}{n^2+1^2}+\frac{n}{n^2+2^2}+\frac{n}{n^2+3^2}+\ldots+\frac{1}{5n}\right)=$

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

(B) $\tan^{-1}3$

(C) $\tan^{-1}2$

(D) $\frac{\pi}{2}$

44. The area of the region bounded by the line $y=3x$ and the curve $y=x^2$ in sq. units is

(A) 10

(B) $\frac{9}{2}$

(C) 9

(D) 5

45. The area of the region bounded by the line $y=x$ and the curve $y=x^3$ is

(A) 0.2 sq. units

(B) 0.3 sq. units

(C) 0.4 sq. units

(D) 0.5 sq. units

46. The solution of $e^{\frac{dy}{dx}}=x+1, y(0)=3$ is

(A) $y-2=x\log x-x$

(B) $y-x-3=x\log x$

(C) $y-x-3=(x+1)\log(x+1)$

(D) $y+x-3=(x+1)\log(x+1)$

47. The family of curves whose x and y intercepts of a tangent at any point are respectively double the x and y coordinates of that point is

(A) $xy=C$

(B) $x^2+y^2=C$

(C) $x^2-y^2=C$

(D) $\frac{y}{x}=C$

48. The vectors $\overrightarrow{AB}=3\hat{i}+4\hat{k}$ and $\overrightarrow{AC}=5\hat{i}-2\hat{j}+4\hat{k}$ are the sides of a $\triangle ABC$. The length of the median through A is

(A) $\sqrt{18}$

(B) $\sqrt{72}$

(C) $\sqrt{33}$

(D) $\sqrt{288}$

49. The volume of the parallelopiped whose co-terminus edges are $\hat{j}+\hat{k}, \hat{i}+\hat{k}$ and $\hat{i}+\hat{j}$ is

(A) 6 cu. Units
(B) 2 cu. Units
(C) 4 cu. Units
(D) 3 cu. units

50. Let $\vec{a}$ and $\vec{b}$ be two-unit vectors and θ is the angle between them. Then $\vec{a}+\vec{b}$ is a unit vector if

(A) $\theta=\frac{\pi}{4}$
(B) $\theta=\frac{\pi}{3}$
(C) $\theta=\frac{2\pi}{3}$
(D) $\theta=\frac{\pi}{2}$

51. If $\vec{a},\vec{b},\vec{c}$ are three non-coplanar vectors and p,q,r are vectors defined by $\vec{p}=\frac{\vec{a}\times\vec{c}}{\left[\vec{a}\vec{b}\vec{c}\right]}, \vec{q}=\frac{\vec{c}\times\vec{a}}{\left[\vec{a}\vec{b}\vec{c}\right]}, \vec{r}=\frac{\vec{a}\times\vec{b}}{\left[\vec{a}\vec{b}\vec{c}\right]}$ then $(\vec{a}+\vec{b})\cdot\vec{p}+(\vec{b}+\vec{c})\cdot\vec{q}+(\vec{c}+\vec{a})\cdot\vec{r}$ is

(A) 0
(B) 1
(C) 2
(D) 3

52. If lines $\frac{x-1}{-3}=\frac{y-2}{2k}=\frac{z-3}{2}$ and $\frac{x-1}{3k}=\frac{y-5}{1}=\frac{z-6}{-5}$ are mutually perpendicular then k is equal to

(A) $-\frac{10}{7}$
(B) $-\frac{7}{10}$
(C) -10
(D) -7

53. The distance between the two planes $2x+3y+4z=4$ and $4x+6y+8z=12$ is

(A) 2 units
(B) 8 units
(C) $\frac{2}{\sqrt{29}}$ units
(D) 4 units

54. The sine of the angle between the straight line $\frac{x-2}{3}=\frac{y-3}{4}=\frac{4-z}{-5}$ are the plane $2x-2y+z=5$ is

(A) $\frac{1}{5\sqrt{2}}$
(B) $\frac{2}{5\sqrt{2}}$
(C) $\frac{3}{50}$
(D) $\frac{3}{\sqrt{50}}$

55. The equation $xy=0$ in three-dimensional space represents

(A) A pair of straight lines
(B) A plane
(C) A pair of planes at right angles
(D) A pair of parallel planes

56. The plane containing the point $(3,2,0)$ and the line $\frac{x-3}{1}=\frac{y-6}{5}=\frac{z-4}{4}$ is

(A) $x-y+z=1$
(B) $x+y+z=5$
(C) $x+2y-z=1$
(D) $2x-y+z=5$

57. Corner points of the feasible region for an LPP are $(0,2),(3,0),(6,0),(6,8)$ and $(0,5)$. Let $z=4x+6y$ be the objective function. The minimum value of z occurs at

(A) Only $(0,2)$
(B) Only $(3,0)$
(C) The mid-point of the line segment joining the points $(0,2)$ and $(3,0)$
(D) Any point on the line segment joining the points $(0,2)$ and $(3,0)$

58. A die is thrown 10 times. The probability that an odd number will come up at least once is

(A) $\frac{11}{1024}$

(B) $\frac{1013}{1024}$

(C) $\frac{1023}{1024}$

(D) $\frac{1}{1024}$

59. A random variable X has the following probability distribution:

X	0	1	2
P(X)	$\frac{25}{36}$	k	$\frac{1}{36}$

If the mean of the random variable X is $\frac{1}{3}$, then the variance is

(A) $\frac{1}{18}$

(B) $\frac{5}{18}$

(C) $\frac{7}{18}$

(D) $\frac{11}{18}$

60. If a random variable X follows the binomial distribution with parameters $n=5$, p and $P(X=2)=9P(X=3)$, then p is equal to

(A) 10

(B) $\frac{1}{10}$

(C) 5

(D) $\frac{1}{5}$