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KCET 2020 MATHEMATICS QUESTION PAPER

1. If $y = 2x^{n+1} + \frac{3}{x^n}$, then $x^2 \frac{d^2y}{dx^2}$ is

a) y b) $6n(n+1)y$

c) $n(n+1)y$ d) $x\frac{dy}{dx} + y$

2. If the curves $2x = y^2$ and $2xy = K$ intersect perpendicularly, then the values of K^2 is

a) 8 b) 4

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

3. If $(xe)^y = e^x$, then $\frac{dy}{dx}$ is

a) $\frac{e^x}{x(y-1)}$ b) $\frac{\log x}{(1+\log x)^2}$

c) $\frac{1}{(1+\log x)^2}$ d) $\frac{\log x}{(1+\log x)}$

4. If the side of a cube is increased by 5%, then the surface area of a cube is increased by

a) 20% b) 10%

c) 60% d) 6%

5. The value of $\int \frac{1+x^4}{1+x^6} dx$ is

a) $\tan^{-1} x + \frac{1}{3}\tan^{-1} x^2 + C$

b) $\tan^{-1} x + \tan^{-1} x^3 + C$

c) $\tan^{-1} x + \frac{1}{3}\tan^{-1} x^3 + C$

d) $\tan^{-1} x - \frac{1}{3}\tan^{-1} x^3 + C$

6. The maximum value of $\frac{\log_e x}{x}$, if $x > 0$ is

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

c) 1 d) $\frac{1}{e}$

7. The value of $\int e^{\sin x} \sin 2x \, dx$ is

a) $2e^{\sin x}(\cos x - 1) + C$

b) $2e^{\sin x}(\sin x - 1) + C$

c) $2e^{\sin x}(\sin x + 1) + C$

d) $2e^{\sin x}(\cos x + 1) + C$

8. The value of $\int_{-\frac{1}{2}}^{\frac{1}{2}} \cos^{-1} x \, dx$ is

a) $\frac{\pi^2}{2}$ b) π

c) $\frac{\pi}{2}$ d) 1

9. If $\int \frac{3x+1}{(x+1)(x-2)(x-3)} dx = A\log|x-1| + B\log|x-2| + C\log|x-3| + C$, then the values of A, B and C are respectively

a) $2, -7, 5$ b) $5 - 7, -5$

c) $2, -7, -5$ d) $5, -7, 5$

10. The value of $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$ is ‘

a) $\frac{\pi}{8}\log 2$ b) $\frac{\pi}{2}\log 2$

c) $\frac{\pi}{4}\log 2$ d) $\frac{1}{2}$

11. The area of the region bounded by the curve $y^2 = 8x$ and the line $y = 2x$ is

a) $\frac{8}{3}$ sq units. b) $\frac{16}{3}$ sq. units

c) $\frac{4}{3}$ sq. units d) $\frac{3}{4}$ sq. units

12. The value of $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \frac{\cos x}{1+e^x} dx$ is

a) -2 b) 2
c) 0 d) 1

13. The order of the differential equation obtained by eliminating arbitrary constants in the family of curve $c_1 y = (c_2 + c_3) e^{x+c_4}$ is

a) 4 b) 1
c) 2 d) 3

14. The general solution of the differential equation $x^2 dy - 2xy dx = x^4 \cos x \, dx$ is

a) $y = \cos x + cx^2$ b) $y = x^2 \sin + cx^2$
c) $y = x^2 \sin x + c$ d) $y = \sin x + cx^2$

15. The area of the region bounded by the line $y = 2x+1$, $x-$axis and the ordinates $x = -1$ and $x = 1$ is

a) 5 b) $\frac{9}{4}$
c) 2 d) $\frac{5}{2}$

16. The two vectors $\hat{i} + j + k$ and $\hat{i} + 3j + 5k$ represents the two sides $\overrightarrow{AB}$ and $\overrightarrow{AC}$ respectively of a ΔABC. The length of the median through A is

a) $\sqrt{14}$ b) $\sqrt{\frac{14}{2}}$
c) 14 d) 7

17. If $\vec{a}$ and $\vec{b}$ are unit vectors and θ is the angle between $\vec{a}$ and $\vec{b}$, then $\sin\frac{\theta}{2}$ is

a) $|\vec{a} - \vec{b}|$ b) $|\vec{a} + \vec{b}|$
c) $\frac{|\vec{a} - \vec{b}|}{2}$ d) $\frac{|\vec{a} - \vec{b}|}{2}$

18. The curve passing through the point $(1,2)$ given that the slope of the tangent at any point (x, y) is $\frac{2x}{y}$ represents

a) Hyperbola b) Circle
c) Parabola d) Ellipse

19. If $|\vec{a} \times \vec{b}|^2 + |\vec{a} \cdot \vec{b}|^2 = 144$ and $|\vec{a}| = 6$ then $|\vec{b}|$ is equal to

a) 4 b) 6
c) 3 d) 2

20. The point $(1, -3, 4)$ lies in the octant

a) Eighth b) Second
c) Third d) Fourth

21. If the vector $2\vec{i} - 3\vec{k} + 4\vec{k} + 2\vec{i} + \vec{j} - \vec{k}$ and $\vec{i} - \vec{j} + 2\vec{k}$ are coplanar, then the value of λ is

a) 5 b) 6
c) – 5 d) – 6

22. The distance of the point $(1, 2, -4)$ from the line $\frac{x-3}{2} = \frac{y-3}{3} = \frac{z+5}{6}$ is

a) $\frac{\sqrt{293}}{49}$ b) $\frac{293}{7}$
c) $\frac{\sqrt{293}}{7}$ d) $\frac{293}{49}$

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

a) $\frac{\sqrt{2}}{10}$ b) $\frac{3}{\sqrt{50}}$
c) $\frac{3}{50}$ d) $\frac{4}{5\sqrt{2}}$

24. If a line makes an angle of $\frac{\pi}{3}$ with each of x and y axis, then the acute angle made by

a) $\frac{\pi}{2}$ b) $\frac{\pi}{4}$

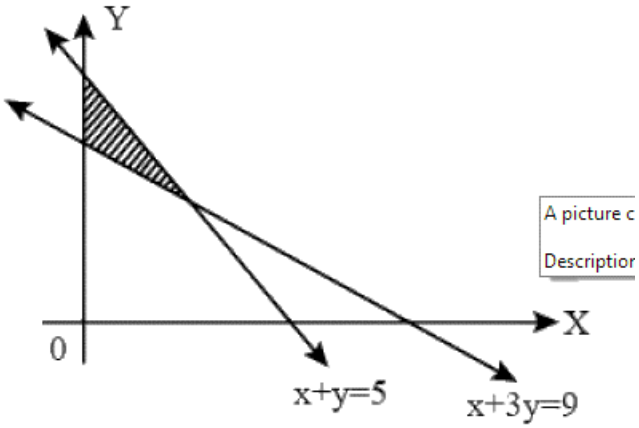
c) $\frac{\pi}{6}$ d) $\frac{\pi}{3}$

25. Corner points of the feasible region determined by the system of linear constraints are $(0,3)(1,1)$ and $(3,0)$. Let $z = px+qy$, where $p,q>0$. Condition on p and q so that the minimum of z occurs at $(3,0)$ and $(1,1)$ is

a) $p=q$ b) $p=2q$

c) $p=\frac{q}{2}$ d) $p=3q$

26. The feasible region of an LPP is shown in the figure. If $Z=11x+7y$, then the maximum value of Z occurs at



a) $(3,2)$ b) $(0,5)$

c) $(3,3)$ d) $(5,0)$

27. A die is thrown 10 times, the probability that an odd number will come up at least one time is

a) $\frac{1013}{1024}$ b) $\frac{1}{1024}$

c) $\frac{1023}{1024}$ d) $\frac{11}{1024}$

28. If A and B are two events such that $P(A)=\frac{1}{3}, P(B)=\frac{1}{2}$ and $P(A\cap B)=\frac{1}{6}$ then $P(A'|B)$ is

a) $\frac{1}{4}$ b) $\frac{1}{2}$

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

29. Events E_1 and E_2 form a partition of the sample S. A is any event such that $P(E_1)=P(E_2)=\frac{1}{2}, P(E_2|A)=\frac{1}{2}$ and $(A|E_2)=\frac{2}{3}$. Then $P(E_1|A)$ is

a) $\frac{1}{4}$ b) $\frac{1}{2}$

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

30. The probability of solving a problem by three persons A, B and C independently is $\frac{1}{2}, \frac{1}{4}$ and $\frac{1}{3}$ respectively. Then the probability that the problem is solved by any two of them is

a) $\frac{1}{8}$ b) $\frac{1}{12}$

c) $\frac{1}{4}$ d) $\frac{1}{24}$

31. If $n(A)=2$ and total number of possible relations from set A to set B is 1024, then $n(B)$ is

a) 5 b) 512

c) 20 d) 10

32. The value of $\sin^2 51^\circ + \sin^2 39^\circ$ is

a) $\cos 12^\circ$ b) 1

c) 0 d) $\sin 12^\circ$

33. If $\tan A+\cot A=2$, then the value of $\tan^4 A+\cot^4 A=$
a) 5 b) 2
c) 1 d) 4

34. If $A=\{1,2,3,4,5,6\}$ then the number of subsets of A which contain at least two elements is
a) 58 b) 64
c) 63 d) 57

35. If $z=x+iy$, then the equation $|z+1|=|z-1|$ represents
a) $y-$axis b) a circle
c) a parabola d) $x-$axis

36. The value of ${}^{16}C_9+{}^{16}C_{10}-{}^{16}C_6-{}^{16}C_7$ is
a) ${}^{17}C_2$ b) 0
c) 1 d) ${}^{17}C_{10}$

37. The number of terms in the expansion of $(x+y+z)^{10}$ is
a) 110 b) 66
c) 142 d) 11

38. If $P(n):2^n<n!$, then the smallest positive integer for which $P(n)$ is true if
a) 5 b) 2
c) 3 d) 4

39. The two lines $lx+my=n$ and $l'x+m'y=n'$ are perpendicular if
a) $lm'+ml'=0$ b) $ll'+mm'=0$
c) $lm'+ml'$ d) $lm'+l'm'=0$

40. If the parabola $x^2=4ay$ passes through the point $(2,1)$, then the length of the latus rectum is
a) 8 b) 1
c) 4 d) 2

41. If the sum of n terms of an A.P is given by $S_n=n^2+n$, then the common difference of the A.P. is
a) 6 b) 4
c) 1 d) 2

42. The negation of the statement "For all real numbers x and y, $x+y=y+x$"is
a) For some real numbers x and y, $x-y=y-x$
b) For all real numbers x and y, $x+y\neq y+x$
c) For some real numbers x and $y, x+y=y+x$
d) For some real numbers x and y, $x+y\neq y+x$

43. The standard deviation of the data $6,7,8,9,10$ is
a) 10 b) $\sqrt{2}$
c) $\sqrt{10}$ d) 2

44. $\lim\limits_{x\to\infty}\left(\dfrac{\tan x}{\sqrt{2x+4}-2}\right)$ is equal to
a) 6 b) 2
c) 3 d) 4

45. If a relation R on the set $(1,2,3)$ be defined $R=\{(1,1,)\}$, then R is
a) Only symmetric
b) Reflexive and symmetric
c) Reflexive and transitive
d) Symmetric and transitive

46. Let $f:[2,\infty]\to R$ be the function defined by $f(x)=x^2-4x+5$ then the range of f is
a) $[5,\infty)$ b) $(-\infty,\infty)$
c) $[1,\infty)$ d) $(1,\infty)$

47. If A, B, C are three mutually exclusive and exhaustive events of an experiment such that $P(A)=2P(B)=3P(C)$, then $P(B)$ is equal to

a) $\frac{4}{11}$ b) $\frac{1}{11}$

c) $\frac{2}{11}$ d) $\frac{3}{11}$

48. The domain of the function defined by $f(x)=\cos^{-1}\sqrt{x-1}$ is

a) $[0,1]$ b) $[1,2]$

c) $[0,2]$ d) $[-1,1]$

49. The value of $\cos\left(\sin^{-1}\frac{\pi}{3}+\cos^{-1}\frac{\pi}{3}\right)$ is

a) Does not exist b) 0

c) 1 d) – 1

50. If $A\begin{pmatrix}0&0&1\\0&1&0\\1&0&0\end{pmatrix}$, then A^4 is equal to

a) $4A$ b) A

c) $2A$ d) I

51. If $A=(a,b,c)$, then the number of binary operations on A is

a) 3^9 b) 3

c) 3^6 d) 3^3

52. If $\begin{pmatrix}2&1\\3&2\end{pmatrix}A=\begin{pmatrix}1&0\\0&1\end{pmatrix}$, then the matrix A is

a) $\begin{pmatrix}2&-1\\3&2\end{pmatrix}$ b) $\begin{pmatrix}2&1\\3&2\end{pmatrix}$

c) $\begin{pmatrix}2&-1\\-3&2\end{pmatrix}$ d) $\begin{pmatrix}-2&1\\3&-2\end{pmatrix}$

53. If $f(x)=\begin{vmatrix}x^3-x & a+x & b+x\\ x-a & x^2-x & c+x\\ x-b & x-c & 0\end{vmatrix}$, then

a) $f(-1)=0$ b) $f(1)=0$

c) $f(2)=0$ d) $f(0)=0$

54. If A and b are square matrices of same order and B is a skew symmetric matrix, then $A'BA$ is

a) Skew symmetric matrix

b) Symmetric matrix

c) Null matrix

d) Diagonal matrix

55. If A is a square matrix of order 3 and $|A|=5$ then $|A\,adj\,A|$ is

a) 625 b) 5

c) 125 d) 25

56. If $f(x)=\begin{cases}\frac{1-\cos Kx}{x\sin x} & if \quad x\neq 0\\ \frac{1}{2} & if \quad x=0\end{cases}$ is continuous at $x=0$, then the value of K is

a) ± 1 b) $\pm\frac{1}{2}$

c) 0 d) ± 2

57. If $a_1, a_2, a_3 \ldots\ldots a_9$ are in A.P then the value of $\begin{vmatrix}a_1&a_2&a_3\\a_4&a_5&a_6\\a_7&a_8&a_9\end{vmatrix}$ is

a) 1 b) $\frac{9}{2}(a_1+a_9)$

c) a_1+a_9 d) $\log e\left(\log_e e\right)$

58. If $2^x+2^y=2^{x+y}$, then $\frac{dy}{dx}$ is

a) $\frac{2^{y-1}}{2^{x-1}}$ b) 2^{y-x}

c) -2^{y-x} d) 2^{x-y}

59. If $f(x)=\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ then $f'(\sqrt{3})$ is

a) $-\frac{1}{\sqrt{3}}$ b) $-\frac{1}{2}$

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

60. The right hand and left limit of the function $f(x)=\begin{cases}\frac{e^{3/x}-1}{e^{3/x}+1} & if\ x\neq 0\\ & x=0\end{cases}$ are respectively

a) −1and 1 b) 1 and 1

c) 1 and – 1 d) – 1 and – 1

ANSWER KEYS

1. (c)	2. (a)	3. (b)	4. (b)	5. (c)	6. (d)	7. (b)	8. (c)	9. (a)	10. (a)
11. (c)	12. (d)	13. (b)	14. (b)	15. (d)	16. (a)	17. (d)	18.(a)	19. (d)	20. (d)
21. (b)	22. (c)	23. (a)	24. (b)	25. (c)	26. (a)	27. (c)	28. (b)	29.(b)	30. (c)
31. (a)	32. (b)	33. (b)	34. (d)	35.(a)	36. (b)	37. (b)	38. (d)	39. (b)	40. (c)
41. (d)	42. (d)	43. (b)	44. (b)	45. (d)	46. (c)	47. (d)	48.(b)	49. (a)	50. (d)
51. (a)	52. (c)	53. (d)	54. (a)	55. (c)	56. (a)	57. (d)	58. (c)	59. (c)	60. (c)