KCET – 2022 TEST PAPER WITH ANSWER KEY (HELD ON THURSDAY 16TH JUNE 2022)

MATHEMATICS

1. Find the mean number of heads in three tosses of a fair coin :

(A) 1.5 (B) 4.5

(C) 2.5 (D) 3.5

Ans. A

2. If A and B are two events such that $P(A)=\frac{1}{2}$, $P(B)=\frac{1}{2}$ and $P(A\,|\,B)=\frac{1}{4}$, then $P(A'\cap B')$ is

(A) $\frac{1}{4}$ (B) $\frac{3}{16}$

(C) $\frac{1}{12}$ (D) $\frac{3}{4}$

Ans. A

3. A pandemic has been spreading all over the world. The probabilities are 0.7 that there will be a lockdown, 0.8 that the pandemic is controlled in one month if there is a lockdown and 0.3 that it is controlled in one month if there is no lockdown. The probability that the pandemic will be controlled in one month is

(A) 0.65 (B) 1.65

(C) 1.46 (D) 0.46

Ans. A

4. If A and B are two independent events such that $P(\bar{A})=0.75$, $P(A\cup B)=0.65$ and $P(B)=x$, then find the value of x :

(A) $\frac{5}{14}$ (B) $\frac{8}{15}$

(C) $\frac{9}{14}$ (D) $\frac{7}{15}$

Ans. B

5. Suppose that the number of elements in set A is p, the number of elements in set B is q and the number of elements in $A\times B$ is 7 then $p^2+q^2=$ _____

(A) 50 (B) 51

(C) 42 (D) 49

Ans. A

6. The domain of the function $f(x)=\frac{1}{\log_{10}(1-x)}+\sqrt{x+2}$ is

(A) $[-2,\ 0)\cap(0,\ 1)$ (B) $[-2,\ 1)$

(C) $[-2,\ 0)$ (D) $[-2,\ 0)\cup(0,\ 1)$

Ans. D

7. The trigonometric function y = tan x in the II quadrant

(A) Decreases from 0 to ∞ (B) Decreases from $-\infty$ to 0

(C) Increases from 0 to ∞ (D) Increases from $-\infty$ to 0

Ans. D

8. The degree measure of $\frac{\pi}{32}$ is equal to

(A) $5^\circ\ 30'\ 20''$ (B) $5^\circ\ 37'\ 20''$

(C) $5^\circ\ 37'\ 30''$ (D) $4^\circ\ 30'\ 30''$

Ans. C

9. The value of $\sin\frac{5\pi}{12}\sin\frac{\pi}{12}$ is

(A) 0 (B) 1

(C) $\frac{1}{2}$ (D) $\frac{1}{4}$

Ans. D

10. $\sqrt{2+\sqrt{2+\sqrt{2+2\cos 8\theta}}}$ =

(A) $\sin 2\theta$ (B) $2\cos\theta$

(C) $2\sin\theta$ (D) $2\cos\frac{\theta}{2}$

Ans. B

11. If A = {1, 2, 3, ... 10} then number of subsets of A containing only odd numbers is

(A) 31 (B) 27

(C) 32 (D) 30

Ans. A

12. If all permutations of the letters of the word MASK are arranged in the order as in dictionary with or without meaning, which one of the following is 19^{th} word ?

(A) KAMS (B) SAMK

(C) AKMS (D) AMSK

Ans. Bonus

13. If $a_1, a_2, a_3, ..., a_{10}$ is a geometric progression and $\frac{a_3}{a_1} = 25$, then $\frac{a_9}{a_5}$ equals

(A) $3(5^2)$ (B) 5^4

(C) 5^3 (D) $2(5^2)$

Ans. B

14. If the straight line $2x - 3y + 17 = 0$ is perpendicular to the line passing through the points $(7, 17)$ and $(15, \beta)$, then β equals

(A) -5 (B) 5

(C) 29 (D) -29

Ans. B

15. The octant in which the point $(2, -4, -7)$ lies is

(A) Eighth (B) Third

(C) Fourth (D) Fifth

Ans. A

16. If $f(x) = \begin{cases} x^2 - 1, & 0 < x < 2 \\ 2x + 3, & 2 \le x < 3 \end{cases}$,

the quadratic equation whose roots are $\lim\limits_{x \to 2^-} f(x)$ and $\lim\limits_{x \to 2^+} f(x)$ is

(A) $x^2 - 14x + 49 = 0$ (B) $x^2 - 10x + 21 = 0$

(C) $x^2 - 6x + 9 = 0$ (D) $x^2 - 7x + 8 = 0$

Ans. B

17. If $3x + i(4x - y) = 6 - i$ where x and y are real numbers, then the values of x and y are respectively,

(A) 3, 9 (B) 2, 4

(C) 2, 9 (D) 3, 4

Ans. C

18. If the standard deviation of the numbers $-1, 0, 1, k$ is $\sqrt{5}$ where $k > 0$, then k is equal to

(A) $4\sqrt{\frac{5}{3}}$ (B) $\sqrt{6}$

(C) $2\sqrt{\frac{10}{3}}$ (D) $2\sqrt{6}$

Ans. D

19. If the set x contains 7 elements and set y contains 8 elements, then the number of bijections from x to y is

(A) 0 (B) $8\ P_7$

(C) 7 ! (D) 8 !

Ans. A

20. If $f : R \to R$ be defined by

$$f(x) = \begin{cases} 2x & : \quad x > 3 \\ x^2 & : \quad 1 < x \le 3 \\ 3x & : \quad x \le 1 \end{cases}$$

then $f(-1) + f(2) + f(4)$ is

(A) 5 (B) 10

(C) 9 (D) 14

Ans. C

21. Let the relation R is defined in N by a R b, if 3a + 2b = 27 then R is

(A) {(1, 12) (3, 9) (5, 6) (7, 3)}

(B) $\left\{\left(0,\frac{27}{2}\right)(1,12)(3,9)(5,6)(7,3)\right\}$

(C) {(1, 12) (3, 9) (5, 6) (7, 3) (9, 0)}

(D) {(2, 1) (9, 3) (6, 5) (3, 7)}

Ans. A

22. $\lim\limits_{y\to 0}\frac{\sqrt{3+y^3}-\sqrt{3}}{y^3}=$

(A) $\frac{1}{2\sqrt{3}}$

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

(C) $2\sqrt{3}$

(D) $3\sqrt{2}$

Ans. A

23. If A is a matrix of order 3 × 3, then $(A^2)^{-1}$ is equal to

(A) $(-A^2)^2$

(B) $(A^{-1})^2$

(C) A^2

(D) $(-A)^{-2}$

Ans. B or D

24. If $A=\begin{bmatrix}2 & -1\\ 3 & -2\end{bmatrix}$, then the inverse of the matrix A^3 is

(A) A

(B) –1

(C) 1

(D) –A

Ans. A

25. If A is a skew symmetric matrix, then A^{2021} is

(A) Row matrix

(B) Column matrix

(C) Symmetric matrix

(D) Skew symmetric matrix

Ans. D

26. If $A=\begin{bmatrix}0 & 1\\ 0 & 0\end{bmatrix}$ then $(aI + bA)^n$ is (where I is the identify matrix of order 2)

(A) $a^2I+a^{n-1}b\cdot A$

(B) $a^nI+n\cdot a^{n-1}b\cdot A$

(C) $a^nI+n\,a^nbA$

(D) a^nI+b^nA

Ans. B

27. If A is a 3 × 3 matrix such that | 5 . adj A| = 5 then |A| is equal to

(A) ±1

(B) ±1/25

(C) ±1/5

(D) ±5

Ans. C

28. If 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 the sum of these numbers is

(A) –4 (B) 9

(C) 4 (D) 5

Ans. A

29. If the vertices of a triangle are (–2, 6) (3, –6) and (1, 5), then the area of the triangle is

(A) 40 sq. units (B) 15.5 sq. units

(C) 30 sq. units (D) 35 sq. units

Ans. B

30. Domain $\cos^{-1}[x]$ is, where [ ] denotes a greatest integer function

(A) (–1, 2] (B) (–1, 2)

(C) [–1, 2] (D) [–1, 2)

Ans. D

31. If $y = (1+x^2)\tan^{-1}x - x$ then $\frac{dy}{dx}$ is

(A) $2x\tan^{-1}x$ (B) $\frac{\tan^{-1}x}{x}$

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

Ans. A

32. If $x = e^{\theta}\sin\theta, y = e\theta\cos\theta$ where θ is a parameter, then $\frac{dy}{dx}$ at $(1,1)$ is equal to

(A) 0 (B) $\frac{1}{2}$

(C) $-\frac{1}{2}$ (D) $-\frac{1}{4}$

Ans. Bonus

33. If $y = e^{\sqrt{x\sqrt{x\sqrt{x}}\ldots}}\ x > 1$ then $\frac{d^2y}{dx^2}$ at $x = \log_e^3$ is

(A) 3 (B) 5

(C) 0 (D) 1

Ans. A

34. If $f(1) = 1, f'(1) = 3$ then the derivative of $f(f(f(x))) + (f(x))^2$ at $x = 1$ is

(A) 10 (B) 33

(C) 35 (D) 12

Ans. B

35. If $y = x^{\sin x} + (\sin x)^x$ then $\frac{dy}{dx}$ at $x = \frac{\pi}{2}$ is

(A) $\frac{4}{\pi}$ (B) $\pi \log \frac{\pi}{2}$

(C) 1 (D) $\frac{\pi^2}{2}$

Ans. C

36. If $A_n = \begin{bmatrix} 1-n & n \\ n & 1-n \end{bmatrix}$ then $|A_1| + |A_2| + ... + |A_{2021}| =$

(A) –2021 (B) $(-2021)^2$

(C) $(2021)^2$ (D) 4042

Ans. B

37. The function $f(x) = \log(1+x) - \frac{2x}{2+x}$ is increasing on

(A) $(-\infty, \infty)$ (B) $(\infty, -1)$

(C) $(-1, \infty)$ (D) $(-\infty, 0)$

Ans. C

38. The co-ordinates of the point on the $\sqrt{x} + \sqrt{y} = 6$ at which the tangent is equally inclined to the axes is

(A) $(4,4)$ (B) $(1,1)$

(C) $(9,9)$ (D) $(6,6)$

Ans. C

39. The function $f(x) = 4\sin^3 x - 6\sin^2 x + 12\sin x + 100$ is strictly

(A) decreasing in $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$ (B) decreasing in $\left[0, \frac{\pi}{2}\right]$

(C) increasing in $\left(\pi, \frac{3\pi}{2}\right)$ (D) decreasing in $\left(\frac{\pi}{2}, \pi\right)$

Ans. D

40. If $[x]$ is the greatest integer function not greater than x then $\int_0^8 [x]dx$ is equal to

(A) 28 (B) 30

(C) 29 (D) 20

Ans. A

41. $\int_0^{\pi/2} \sqrt{\sin\theta}\cos^3\theta\, d\theta$ is equal to

(A) $\frac{8}{23}$ (B) $\frac{7}{23}$

(C) $\frac{8}{21}$ (D) $\frac{7}{21}$

Ans. C

42. If $e^y + xy = e$ the ordered pair $\left(\frac{dy}{dx}, \frac{d^2y}{dx^2}\right)$ at $x = 0$ is equal to

(A) $\left(\frac{1}{e}, \frac{1}{e^2}\right)$ (B) $\left(\frac{-1}{e}, \frac{-1}{e^2}\right)$

(C) $\left(\frac{1}{e}, \frac{-1}{e^2}\right)$ (D) $\left(\frac{-1}{e}, \frac{1}{e^2}\right)$

Ans. D

43. $\int \frac{\cos 2x - \cos 2\alpha}{\cos x - \cos\alpha} dx$ is equal to

(A) $2(\sin x - x\cos\alpha) + c$ (B) $2(\sin x + x\cos\alpha) + c$

(C) $2(\sin x - 2x\cos\alpha) + c$ (D) $2(\sin x + 2x\cos\alpha) + c$

Ans. B

44. $\int_0^1 \frac{xe^x}{(2+x)^3} dx$ is equal to

(A) $\frac{1}{27}\cdot e - \frac{1}{8}$ (B) $\frac{1}{27}\cdot e + \frac{1}{8}$

(C) $\frac{1}{9}\cdot e + \frac{1}{4}$ (D) $\frac{1}{9}\cdot e - \frac{1}{4}$

Ans. D

45. If $\int \frac{dx}{(x+2)(x^2+1)} = a\log|1+x^2| + b\tan^{-1}x + \frac{1}{5}\log|x+2| + c$, then

(A) $a = \frac{-1}{10} b = \frac{2}{5}$ (B) $a = \frac{1}{10} b = \frac{2}{5}$

(C) $a = \frac{-1}{10} b = \frac{-2}{5}$ (D) $a = \frac{1}{10} b = \frac{-2}{5}$

Ans. A

46. Area of the region bounded by the curve $y = \tan x$, the x-axis and line $x = \frac{\pi}{3}$ is

(A) $\log\frac{1}{2}$ (B) $\log 2$

(C) 0 (D) $-\log 2$

Ans. B

47. Evaluate $\int_2^3 x^2 dx$ as the limit of a sum

(A) $\frac{72}{6}$ (B) $\frac{53}{9}$

(C) $\frac{25}{7}$ (D) $\frac{19}{3}$

Ans. D

48. $\int_0^{\pi/2} \frac{\cos x \sin x}{1+\sin x} dx$ is equal to

(A) $\log 2 - 1$ (B) $\log 2$

(C) $-\log 2$ (D) $1 - \log 2$

Ans. D

49. If $\frac{dy}{dx} + \frac{y}{x} = x^2$, then $2y(2) - y(1) =$

(A) $\frac{11}{4}$ (B) $\frac{15}{4}$

(C) $\frac{9}{4}$ (D) $\frac{13}{4}$

Ans. B

50. The solution of the differential equation $\frac{dy}{dx} = (x+y)^2$ is

(A) $\tan^{-1}(x+y) = x + c$ (B) $\tan^{-1}(x+y) = 0$

(C) $\cot^{-1}(x+y) = c$ (D) $\cot^{-1}(x+y) = x + c$

Ans. A

51. If y(x) be the solution of differential equation $x\log x\frac{dy}{dx} + y = 2x\log x, y(e)$ is equal to

(A) e (B) 0

(C) 2 (D) 2e

Ans. D

52. If $|\vec{a}| = 2$ and $|\vec{b}| = 3$ and the angle between $\vec{a}$ and $\vec{b}$ is 120^o, then the length of the vector $\left|\frac{1^{\vec{a}}}{2} - \frac{1^{\vec{b}}}{3}\right|^2$ is

(A) 2 (B) 3

(C) 1/6 (D) 1

Ans. Bonus

53. If $|\vec{a} \times \vec{b}| + |\vec{a}.\vec{b}|^2 = 36$ and $|\vec{a}| = 3$ then $|\vec{b}|$ is equal to

(A) 9 (B) 36

(C) 4 (D) 2

Ans. Bonus

54. If $\vec{\alpha} = \hat{i} - 3\hat{j}, \vec{\beta} = \hat{i} + 2\hat{j} - \hat{k}$ then express $\vec{\beta}$ in the form $\vec{\beta} = \vec{\beta}_1 + \vec{\beta}_2$ where $\vec{\beta}_1$ is parallel to $\vec{\alpha}$ and $\vec{\beta}_2$ is parpendicular to $\vec{\alpha}$ then $\vec{\beta}_1$ is given by

(A) $\frac{5}{8}\left(\hat{i} - 3\hat{j}\right)$ (B) $\frac{5}{8}\left(\hat{i} + 3\hat{j}\right)$

(C) $\hat{i} - 3\hat{j}$ (D) $\hat{i} + 3\hat{j}$

Ans. Bonus

55. The sum of the degree and order of the differential equation $\left(1 + y_1^2\right)^{2/3} = y_2$ is

(A) 4 (B) 6

(C) 5 (D) 7

Ans. C

56. The co-ordinates of foot of the perpendicular drawn from the origin to the plane $2x - 3y + 4z = 29$ are

(A) $(2,3,4)$ (B) $(2,-3,-4)$

(C) $(2,-3,4)$ (D) $(-2,-3,4)$

Ans. C

57. The angle between the pair of lines $\frac{x+3}{3} = \frac{y-1}{5} = \frac{z+3}{4}$ and $\frac{x+1}{1} = \frac{y-4}{4} = \frac{z-5}{2}$ is

(A) $\theta = \cos^{-1}\left[\frac{27}{5}\right]$ (B) $\theta = \cos^{-1}\left[\frac{8\sqrt{3}}{15}\right]$

(C) $\theta = \cos^{-1}\left[\frac{19}{21}\right]$ (D) $\theta = \cos^{-1}\left[\frac{5\sqrt{3}}{16}\right]$

Ans. Bonus

58. The corner points of the feasible region of an LPP are $(0,2),(3,0),(6,0),(6,8)$ and $(0,5)$ then the minimum value of $z = 4x + 6y$ occurs at

(A) Finite number of points
(B) Infinite number of points
(C) Only one point
(D) Only two points

Ans. D

59. A dietician has to develop a special diet using two foods X and Y. Each packet (containing 30 g) of food. X contains 12 units of calcium, 4 unit of iron, 6 units of cholesterol and 6 units of vitamin A. Each packet of the same quantity of food Y contains 3 units of calcium, 20 units of iron, 4 units of cholesterol and 3 units of vitamin A. The diet requires at least 240 units of calcium, atleast 460 units of iron and atmost 300 units of cholesterol. The corner points of the feasible region are

(A) $(2,72),(40,15),(15,20)$
(B) $(2,72),(15,20),(0,23)$
(C) $(0,23),(40,15),(2,72)$
(D) $(2,72),(40,15),(115,0)$

Ans. A

60. The distance of the point whose position vector is $\left(2\hat{i}+\hat{j}-\hat{k}\right)$ from the plane $\vec{r}.\left(\hat{i}-2\hat{j}+4\hat{k}\right)=4$ is

(A) $\frac{8}{\sqrt{21}}$
(B) $8\sqrt{21}$
(C) $-\frac{8}{\sqrt{21}}$
(D) $-\frac{8}{21}$

Ans. A