KCET MATHEMATICS MODEL QUESTION PAPER-2

1. Let $n(U) = 700, n(1) = 200, n(2) = 300, n(A \cap B) = 100$ then $n(A' \cap B') =$

(1) 400 (2) 300 (3) 600 (4) 200

2. The value of $cos\ 12^0 + cos\ 84^0 + \cos 156^0 + \cos 132^0$ is

(1) $\frac{1}{2}$ (2) 1 (3) $-\frac{1}{2}$ (4) $\frac{1}{8}$

3. $cos^2\left(\frac{\pi}{8} + \frac{x}{2}\right) - sin^2\left(\frac{\pi}{8} - \frac{x}{2}\right)$ is equal to

(1) $\sqrt{2}\cos x$ (2) $\frac{1}{\sqrt{2}}cosx$ (3) $2\ sin\frac{x}{2}$ (4) $\frac{1}{\sqrt{2}}sinx$

4. In an A.P. the p^th^ term is $\frac{1}{q}$ and q^th^ term is $\frac{1}{p}$, then the pq^th^ term is

(1) q (2) p (3) pq (4) 1

5. If $z^2 + z + 1 = 0$, where z is a complex number, then the value of

$\left(z + \frac{1}{z}\right)^2 + \left(z^2 + \frac{1}{z^2}\right)^2 + \left(z^3 + \frac{1}{z^3}\right)^2 + \cdots \ldots \ldots \ldots . + \left(z^6 + \frac{1}{z^6}\right)^2$ is

(1) 18 (2) 54 (3) 6 (4) 12

6. The solution set of $\frac{5x+8}{4-x} \leq 2$

(1) $(4, \infty) \cup (-\infty, 0]$ (2) $[4, \infty] \cup (-\infty, 4]$

(3) $(-\infty, 0] \cup (4, \infty)$ (4) $[4, \infty] \cup (-\infty, 0]$

7. ${}^{20}C_4 + 2\,{}^{20}C_3 + {}^{20}C_2 - {}^{22}C_{18}$ is

(1) 2430 (2) 7330 (3) 1240 (4) 0

8. In the expansion of $(1 + x)^{50}$, the sum of the coefficients of the odd powers of x is

(1) 0 (2) 2^{50} (3) 2^{49} (4) 2^{51}

9. The incentre of the triangle with the vertices $(1, \sqrt{3})$, $(0, 0)$ and $(2, 0)$ is

(1) $\left(1, \frac{\sqrt{3}}{2}\right)$ (2) $\left(\frac{2}{3}, \frac{1}{\sqrt{3}}\right)$ (3) $\left(\frac{2}{3}, \frac{\sqrt{3}}{2}\right)$ (4) $\left(\frac{2}{3}, \frac{1}{\sqrt{3}}\right)$

10. Distance between foci of $5x^2 + 9y^2 = 45$ is

(1) 4 (2) $4\sqrt{2}$ (3) 2 (4) $2\sqrt{2}$

11. The equation to the hyperbola with $e = 2$ and foci $(\pm 2, 0)$ is

(1) $3x^2 - y^2 = 3$ (2) $x^2 - y^2 = 4$ (3) $\frac{x^2}{4} - \frac{y^2}{9} = 1$ (4) $\frac{x^2}{1} - \frac{y^2}{4} = 1$

12. The points $(0, 7, 10)$, $(-1, 6, 6)$ and $(-4, 9, 6)$ form a

(1) right angled triangle (2) isosceles triangle

(3) right angled isosceles triangle (4) equilateral triangle

13. $\lim\limits_{n \to \infty} x \sin\left(\frac{1}{x}\right) =$

(1) 0 (2) 1 (3) ∞ (4) does not exist

14. If $p \to (q \vee r)$ is false, the truth values of p , q and r are

(1) T, F ;F (2) F, F ;F (3) F, T, T (4) T, T, F

15. The standard deviation of 105, 120, 125, 130, 110, 115 and 135 is

(1) 5 (2) 10 (3) 135 (4) 100

16. Two aeroplanes I and II bomb a target in succession. The probabilities of I and II hitting the target correctly are 0.3 and 0.2 respectively. The second plane will bomb only if the first misses the target. The probability that the target is hit by the second plane is

(1) 0.2 (2) 0.7 (3) 0.06 (4) 0.14

17. The function $f(x) = \begin{cases} x^2, & x \le 0 \\ ax + b, & x > 0 \end{cases}$ is a function. The values of a and b for which the function $f(x)$ is continuous are

(1) $a = 1, b = 0$ (2) $a = 0, b = 0$

(3) $a = 0, b = 2$ (4) $b = 0$, a is any real value

18. If $y = \left(1 + x^{1/4}\right)\left(1 + x^{1/2}\right)\left(1 - x^{1/4}\right)$, then $\frac{dy}{dx} =$

(1) 1 (2) -1 (3) x (4) $\sqrt{x}$

19. If $y = \cot^{-1}\left(\sqrt{x^2 - 1}\right) + \sec^{-1} x$, then $\frac{dy}{dx} =$

(1) x (2) 1 (3) 0 (4) -1

20. If $y = e^{\frac{1}{2}\log_e(1+tan^2 x)}$ then $\frac{dy}{dx} =$

(1) $\left(\frac{1}{2}\right) sec^2 x$ (2) $sec^2 x$ (3) $secx\ tanx$ (4) $e^{\frac{1}{2}log(1+tan^2 x)}$

21. In the mean value theorem $\frac{f(b)-f(a)}{b-a} = f'(c)$ if $a = 0, b = 1/2$ and $f(x) = x(x-1)(x-2)$, then value of c is

(1) $1 - \frac{\sqrt{15}}{6}$ (2) $1 + \sqrt{15}$ (3) $1 - \frac{\sqrt{21}}{6}$ (4) $1 + \sqrt{21}$

22. If $y = 1 + \frac{1}{x} + \frac{1}{x^2} + \frac{1}{x^3} + \cdots$ ... . to infinity where $x > 1$, then $\frac{dy}{dx}$ is

(1) $\frac{1}{(x-1)}$ (2) $-\frac{1}{(x+1)}$ (3) $-\frac{1}{1-x^2}$ (4) $-\frac{1}{(x-1)^2}$

23. The approximate value of $\log_e(4.01)$ given that $\log_e 4 = 1.3863$

(1) 1.33 (2) 1.3888 (3) 2.38 (4) 1.888

24. If a particle moves according to the law, $s = \frac{t^3}{3} - 3t^2 + 8t$, then the distance covered before it comes to rest is

(1) $\frac{16}{3}$ (2) 8 (3) $\frac{10}{3}$ (4) $\frac{20}{3}$

25. Let $f'(x) = e^x(x-1)(x-2)$. Then f decreases in the interval

(1) $(-\infty, -2)$ (2) $(-2, -1)$ (3) $(1, 2)$ (4) $(2, \infty)$

26. The function $f(x) = \frac{x}{2} + \frac{2}{x}$, has a local minimum at

(1) $x = 2$ (2) $x = -2$ (3) $x = 0$ (4) $x = 1$

27. For the curve $xy = 25$ the tangent at any point on it cuts the x and y axes at A and B. The area of triangle OAB is

(1) 50 sq. units (2) 25 sq. units (3) 100 sq. units (4) 75 sq. units

28. A gardener is digging a plot of land. As he gets tired, he works more slowly. After 't' minutes he is digging at a rate of $\frac{2}{\sqrt{t}}$ square meters per minute. How long will it take him to dig an area of 40 square meters?

(1) 30 minutes (2) 100 minutes (3) 40 minutes (4) 10 minutes

29. If $E(\alpha) = \begin{bmatrix} cos^2\alpha & cos\alpha sin\alpha \\ cos\alpha sin\alpha & sin^2\alpha \end{bmatrix}$ and α and β differ by an odd multiple of $\pi/2$ then $E(\alpha).E(\beta)$ is a

(1) unit matrix (2) null matrix (3) diagonal matrix (4) none of these

30. The matrix A satisfying the equation $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} A = \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}$ is

(1) $\begin{bmatrix} 1 & 4 \\ -1 & 0 \end{bmatrix}$ (2) $\begin{bmatrix} 1 & -4 \\ 1 & 0 \end{bmatrix}$ (3) $\begin{bmatrix} 1 & 4 \\ 0 & -1 \end{bmatrix}$ (4) none of these

31. Maximum value of $\begin{vmatrix} 1 + sin^2x & cos^2x & 4sin2x \\ sin^2x & 1 + cos^2x & 4sin2x \\ sin^2x & cos^2x & 1 + 4sin2x \end{vmatrix}$ is

(1) 2 (2) 4 (3) 1 (4) 6

32. For real numbers x and y, the relation R is defined as $xRy \Leftrightarrow x - y + \sqrt{5}$ is an irrational number. Then the relation R is

(1) reflexive (2) symmetric (3) transitive (4) none

33. Which of the following is both commutative and associative?

(1) $a * b = 1 + ab$ on R (2) $a * b = 3a + 5b$ on R

(3) $a * b = a^2 + b^2$ on R (4) $a * b = a + b - ab$ on Q

34. If $[x]$ denotes the greatest integer $\leq x$ then $\left[\frac{2}{3}\right] + \left[\frac{2}{3} + \frac{1}{99}\right] + \left[\frac{2}{3} + \frac{2}{99}\right] + \cdots \ldots + \left[\frac{2}{3} + \frac{98}{99}\right] =$

(1) 99 (2) 98 (3) 66 (4) 65

35. If $g(x) = 1 + \sqrt{x}$ and $f(g(x)) = 3 + 2\sqrt{x} + x$ then the function $f(x)$ equals

(1) $x + 1$ (2) $x^2 + 2$ (3) $x^2 + 1$ (4) $x^2 - 1$

36. If $\cos^{-1} p + \cos^{-1} q + \cos^{-1} r = \pi$, then $p^2 + q^2 + r^2 + 2pqr =$

(1) 3 (2) 1 (3) 2 (4) -1

37. $tan\left[\frac{\pi}{4} + \frac{1}{2}\cos^{-1}\left(\frac{a}{b}\right)\right] \tan^{-1}\left[\frac{\pi}{4} - \frac{1}{2}\cos^{-1}\left(\frac{a}{b}\right)\right] =$

(1) $\frac{2a}{b}$ (2) $\frac{2b}{a}$ (3) $\frac{a}{b}$ (4) $\frac{b}{a}$

38. The value of θ lying between 0 and $\frac{\pi}{2}$, satisfying the determinant

$$\begin{vmatrix} 1 + sin^2\theta & cos^2\theta & 4sin4\theta \\ sin^2\theta & 1 + cos^2\theta & 4sin4\theta \\ sin^2\theta & cos^2\theta & 1 + 4sin4\theta \end{vmatrix} = 0$$

(1) 0 (2) $\frac{7\pi}{24}$ (3) $\frac{24\pi}{7}$ (4) $\frac{13\pi}{17}$

39. The system of linear equations

$x + y + z = 2$

$2x + y - z = 3$

$3x + 2y + kz = 4$, has a unique solution, if

(1) $k \neq 0$ (2) $-1 < k < 1$ (3) $-2 < k < 2$ (4) $k = 0$

40. $\int \frac{dx}{\sin(x-a)\sin(x-b)} =$

(1) $cosec(a - b) \log\left|\frac{sin(x-a)}{sin(x-b)}\right| + C$ (2) $cosec(a - b) \log\left|\frac{sin(x-b)}{sin(x-a)}\right| + C$

(3) $sec(a-b)\log\left|\frac{sin(x-b)}{sin(x-a)}\right|+C$ (4) $sec(a-b)\log\left|\frac{sin(x-a)}{sin(x-b)}\right|+C$

41. $\int\frac{1}{\sqrt{cos^4x-cos^2x.sin^2x}}\,dx$ is equal to

(1) $\sin^{-1}(\tan x)+c$ (2) $-\sin^{-1}(\tan x)+c$ (3) $-\sin^{-1}(\tan x)+c$ (4) $cos^{-1}(\tan x)+c$

42. If $I_n=\int x^n e^x dx$, where $n\in N$ then $I_n+n\,.I_{n-1}=$

(1) $x^n e^x$ (2) $x^{n-1}e^x$ (3) $\frac{1}{n}x^n e^x$ (4) $x^{n+1}e^x$

43. If $I=\int_3^5\frac{\sqrt{x}}{\sqrt{8-x}+\sqrt{x}}dx$ then I equal

(1) 1 (2) 2 (3) 3 (4) 3.5

44. $\int_0^{10\pi}|sinx|\,dx$ is

(1) 20 (2) 8 (3) 10 (4) 18

45. $\int_0^{\pi}x\ cosxdx=$ is

(1) 1 (2) 2 (3) -2 (4) -1

46. $\int_0^{\frac{\pi}{2}}\frac{1}{1+(cotx)^{101}}dx=$

(1) $\frac{\pi}{3}$ (2) $\frac{\pi}{2}$ (3) 0 (4) $\frac{\pi}{4}$

47. The area bounded by the parabolas $y=4x^2$, $y=\frac{x^2}{9}$ and the line $y=2$ is

(1) $\frac{20\sqrt{2}}{3}$ (2) $\frac{10\sqrt{2}}{3}$ (3) $\frac{40\sqrt{2}}{3}$ (4) none of these

48. The differential equation for the family of curves $x^2+y^2-2ay=0$ where 'a' is an arbitrary constant, is

(1) $2(x^2 - y^2)y' = xy$ (2) $2(x^2 + y^2)y' = xy$

(3) $(x^2 - y^2)y' = 2xy$ (4) $(x^2 + y^2)y' = 2xy$

49. The general solution of $x^2 \frac{dy}{dx} = x^2 + xy + y^2$ is

(1) $\tan^{-1}\left(\frac{x}{y}\right) = log|x| + c$ (2) $\tan^{-1}\left(\frac{y}{x}\right) = log|x| + c$

(3) $y = x\ log|x| + c$ (4) $x = y\ log|x| + c$

50. The area of the triangle whose vertices are $A(1, -1, 2)$, $B(2, 1, -1)$ and $C(3, -1, 2)$

(1) $4\sqrt{5}$ (2) $2\sqrt{3}$ (3) $\sqrt{13}$ (4) $\sqrt{15}$

51. $\hat{\imath}\,.(\hat{\jmath} \times \hat{k}) + \hat{\jmath}.(\hat{k} \times \hat{\imath}) + \hat{k}\,.(\hat{\imath} \times \hat{\jmath}) =$

(1) 3 (2) -3 (3) 0 (4) 1

52. Perimeter of the triangle whose sides are given by $2\hat{\imath} - \hat{\jmath} + 2\hat{k}$, $3\hat{\imath} - 4\hat{\jmath}$, $3\hat{\imath} + 2\hat{\jmath} + 6\hat{k}$ is

(1) 10 (2) 12 (3) it is not a triangle (4) 15

53. If D, E, F are points on co-ordinate axes respectively at distances a, b, c from the origin O, then the

(1) (a, b, c) (2) (a/2, b/2, c/2) (3) (a/3, b/3, c/3) (4) (2a, 2b, 2c)

54. The angle between the planes $3x - 4y + 5z = 0$ and $2x - y - 2z = 5$ is

(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{3}$ (3) $\frac{\pi}{4}$ (4) $\frac{\pi}{6}$

55. The direction cosines of the normal to the plane $x + 2y - 3z + 4 = 0$ are

(1) $\frac{1}{\sqrt{14}}, \frac{-2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ (2) $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ (3) $-\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$ (4) $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}$

56. The maximum value of $z = x + 3y$ such that $2x + y \leq 20$, $x + 2y \leq 20$, $x \geq 0$, $y \geq 0$ is

(1) 10 (2) 30 (3) 60 (4) 90

57. A man is known to speak the truth 3 out of 4 times. He throws a die and reports that it is a six. The probability that it is actually a six is

(1) $\frac{3}{8}$ (2) $\frac{3}{4}$ (3) $\frac{1}{5}$ (4) $\frac{2}{5}$

58. The mean and variance of a binomial variable X are 2 and 1 respectively. The probability that X takes value greater than 1, is

(1) (2) $\frac{5}{7}$ (3) $\frac{3}{7}$ (4) $\frac{4}{7}$

59. The statement which is not a proposition is

(1) $3 + 2 = 5$ (2) All the best (3) 5 > 7 (4) $\sqrt{2}$ is an irrational number

60. In the binomial expansion of $(a - b)^n$, $n \geq 5$, the sum of the 5^{th} and 6^{th} terms is zero. Then $\frac{a}{b}$ is

(1) $\frac{n-5}{6}$ (2) $\frac{n-4}{5}$ (3) $\frac{5}{n-4}$ (4) $\frac{6}{n-5}$