KCET MATHEMATICS MODEL QUESTION PAPER-3

1. If A and B are two sets such that $n(1) = 70, n(2) = 60, n(A \cup B) = 110$ then $n(A \cap B) =$

(1) 240 (2) 50 (3) 40 (4) 20

2. The domain of the function $y = \sqrt{x-2} + \sqrt{1-x}$ is

(1) $x \leq 2$ (2) $x \geq 2$ (3) Null set (4) The set of all real numbers

3. The angle between line $\sqrt{3x} + y = 1$ and $x + \sqrt{3y} = 1$ is

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

4. The degree of $x + \frac{d^2y}{dx^2} = \sqrt{1 + \frac{dy}{dx}}$ is

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

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

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

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

6. If $f: [0, \infty) \to [2, \infty)$ is given by $f(x) = x + \frac{1}{x}$

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

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

7. Ram obtained 60 and 85 in first two unit tests. The minimum marks he should get in the third test to have an average of atleast 55 marks is

(1) $x \geq 20$ (2) $x \leq 20$ (3) $x > 20$ (4) $x < 20$

8. A mathematical model written to construct a maximum area rectangle out of a thread of length 10 cm is given by
Maximise lb such that $2(l+b)=10,\ l,b>0$ where l and b are length and breadth of the rectangle.
This is not a linear programming problem because

(1) l and b are always positive (2) first constraint is an equation
(3) the objective function is not minimize (4) objective function is not linear

9. If the occurrence of an event A implies the occurrence of an event B, then $P(A^c \cap B^c)$ is

(1) $P(B^c)$ (2) $P(A^c)P(B^c)$ (3) $P(A^c)$ (4) $1-P(A\cap B)$

10. A card is picked at random from a pack of cards. Given that the picked card is a Queen, what is the probability that it is a spade?

(1) $\frac{1}{3}$ (2) $\frac{4}{13}$ (3) $\frac{1}{4}$ (4) $\frac{1}{2}$

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

12. A certain item is manufactured by 3 factories F_1, F_2 and F_3 with 30% of items made in F_1, 20% in F_2 and 50% in F_3. It is found that 2% of the items produced by F_1, 3% of the items produced by F_2 and 4% of the items produced by F_3 are defective. Suppose that an item selected at random from the stock is found to be defective.
What is the probability that the item came from F_1?

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

13. Given that $P(A)=0.1$, $P\left({}^{B}/_{A}\right)=0.6$ and $P\left({}^{B}/_{A^c}\right)=0.3$ what is $P\left({}^{A}/_{B}\right)$?

(1) $\frac{2}{11}$ (2) $\frac{4}{11}$ (3) $\frac{7}{11}$ (4) $\frac{9}{11}$

14. If a complex number lies in the IIIrd quadrant. Find the quadrant in which its conjugate lies.
(1) I Quadrant (2) II Quadrant (3) III Quadrant (4) IV Quadrant

15. If ${}^{56}P_{r+6} : {}^{54}P_{r+3} = 30800 : 1$, then

(1) $r = 41$ (2) $r = 51$ (3) $r = 31$ (4) None of these

16. Coefficient of variation of two distributions are 60 and 70, their standard devaiations are 21 and 16, respectively. What are their arithmetic means?

(1) 35, 20 (2) 35, 22.85 (3) 30, 22.58 (4) 30, 20

17. Consider an experiment E in which a box contains 10 identical tickets numbered 0 to 10 and 2 tickets are drawn at random from the box. What is the probability that both the tickets have even numbers on them?

(1) $\frac{4}{9}$ (2) $\frac{1}{3}$ (3) $\frac{2}{9}$ (4) $\frac{1}{9}$

18. If $A = \{1,2,3,4\}$ then which one of the following is reflexive?

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

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

19. If β satisfies the inequation $x^2 - x - 6 > 0$, then a value exists for

(1) $\cos^{-1}(cos\beta)$ (2) $\sec^{-1}(sec\beta)$ (3) $\tan^{-1}\beta$ (4) $\sin^{-1}(sin\beta)$

20. If $\cot^{-1}\frac{1}{5} + \cot^{-1}\frac{1}{3} - \cot^{-1}\frac{4}{7} = \cot^{-1}x$, then x is equal to

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

21. If $1 + i = (x + iy)(u + iv)$ then $\tan^{-1}\left(\frac{y}{x}\right) + \cot^{-1}\left(\frac{u}{v}\right)$ has the value

(1) $n\pi + \frac{\pi}{6}\ n \in I$ (2) $2n\pi + \frac{\pi}{3}\ n \in I$ (3) $n\pi + \frac{\pi}{4}\ n \in I$ (4) $n\pi - \frac{\pi}{3}\ n \in I$

22. If $\begin{bmatrix} -2 & 5 \\ 3 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 3 \\ -1 \end{bmatrix}$ then (x, y) is

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

23. If the product of the matrix $\begin{bmatrix} 2 & 6 & 4 \\ 1 & 0 & 1 \\ -1 & 1 & -1 \end{bmatrix}$ with a matrix A has the inverse

$C = \begin{bmatrix} -1 & 0 & 1 \\ 1 & 1 & 3 \\ 2 & 0 & 2 \end{bmatrix}$ then A^{-1} equals

(1) $\begin{bmatrix} -3 & -5 & 5 \\ 0 & 9 & 14 \\ 2 & 2 & 6 \end{bmatrix}$ (2) $\begin{bmatrix} -3 & 5 & 5 \\ 0 & 0 & 9 \\ 2 & 14 & 16 \end{bmatrix}$

(2) $\begin{bmatrix} -3 & -5 & -5 \\ 0 & 0 & 2 \\ 2 & 14 & 6 \end{bmatrix}$ (4) $\begin{bmatrix} -3 & -3 & -5 \\ 0 & 9 & 2 \\ 2 & 14 & 6 \end{bmatrix}$

24. If A and B are two matrices such that $AB = B, BA = A$ then $A^2 + B^2 =$

(1) $2AB$ (2) $2BA$ (3) $A + B$ (4) AB

25. The value of the integral $\int \frac{cosx-1}{cotx-tanx} dx$ is equal to

(1) $-\frac{1}{2}cos4x + C$ (2) $-\frac{1}{4}cos4x + C$

(3) $-\frac{1}{2}cos2x + C$ (4) $\frac{1}{2}log|cos2x| - \frac{1}{4}cos^2 2x + C$

26. 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) $x = y\ log|x| + c$

27. If $\int \frac{3e^x - 5e^{-x}}{4e^x + 5e^{-x}} dx = ax + blog|4e^x + 5e^{-x}| + C$ then

(1) $a = -\frac{1}{8}, b = \frac{7}{8}$ (2) $a = \frac{1}{8}, b = \frac{7}{8}$

(3) $a = -\frac{1}{8}, b = -\frac{7}{8}$ (4) $a = \frac{1}{8}, b = -\frac{7}{8}$

28. The value of the integral $\int \frac{dx}{x\sqrt{1-x^3}}$ is given by

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

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

(4) $\frac{1}{3} log\left|\sqrt{1-x^3}\right| + C$

29. $\int_{-1}^{2} f(x)dx$, where $f(x) = |x+1| + |x| + |x-1|$ is equal to

(1) $\frac{19}{2}$ (2) $\frac{17}{2}$ (3) $\frac{15}{2}$ (4) $\frac{13}{2}$

30. The area bounded by the curve $y = 3x - x^2$and the x −axis is

(1) $\frac{7}{2}$ (2) $\frac{9}{2}$ (3) $\frac{3}{2}$ (4) $\frac{1}{2}$

31. The area bounded by the curve $x = 9 - y^2$ and the y −axis is

(1) 6 sq. units (2) 36 sq. units (3) 16 sq. units (4) 26 sq. units

32. The solution of $(2x - 10y^3)\frac{dy}{dx} + y = 0$

(1) $xy^2 = 2y^5 + C$

(2) $yx^2 = 2y^5 + C$

(3) $x^2y^2 = 2y^5 + C$

(4) None of these

33. The solution of $x^2 \frac{dy}{dx} + y = 1$ is

(1) $x = Ce^{\frac{1}{x}+1}$

(2) $x = Ce^{-\frac{1}{x}+1}$

(3) $y = Ce^{-\frac{1}{x}+1}$

(4) $y = Ce^{\frac{1}{x}+1}$

34. The solution of $(x+y)^2\left(x\frac{dy}{dx} + y\right) = xy\left(1 + \frac{dy}{dx}\right)$ is

(1) $log(xy) = -\frac{1}{x+y} + C$

(2) $log\left(\frac{x}{y}\right) = -\frac{1}{x+y} + C$

(3) $log(xy) = \frac{1}{x-y} + C$

(4) None of these

35. If the coefficients of x^5 and x^6 in $\left(2 + \frac{x}{3}\right)^n$ are equal, then n is

(1) 51 (2) 31 (3) 41 (4) None of these

36. The term independent of x in $\left[\sqrt{\left(\frac{x}{3}\right)}+\sqrt{\left(\frac{3}{2x^2}\right)}\right]^{10}$ is

(1) $\frac{5}{4}$ (2) $\frac{7}{4}$ (3) $\frac{9}{4}$ (4) None of these

37. The sum of the series $\frac{1^2}{1.2}+\frac{1^2+2^2}{2.3}+\frac{1^2+2^2+3^2}{3.4}+\cdots$ ……….. is

(1) $\frac{205}{3}$ (2) $\frac{200}{3}$ (3) $\frac{220}{3}$ (4) $\frac{210}{3}$

38. If a is a parameter then the equation of a family of lines having the sum of these intercepts on axis equal to 7 is

(1) $4x+3y=12a$ (2) $3x+4y=7a$

(3) $7x+ay=a(7-a)$ (4) $ay=(7-a)(a-x)$

39. The equation of the ellipse whose centre is at the origin and the x −axis is the major axis, which passes through the points $(-3,1)$ and $(2,-2,)$ is

(1) $5x^2+3y^2=32$ (2) $3x^2+5y^2=32$

(3) $5x^2-3y^2=32$ (4) $5x^2+3y^2+32=0$

40. $\int \frac{sin2x}{sin^4x+cos^4x}dx$ is

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

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

41. The value of $\int \frac{x+2}{\sqrt{x^2+4x+3}}\,dx$ is equal to

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

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

42. If $I_n=\int_0^{\frac{\pi}{4}} tan^n x dx$, where $n\geq 2$ then, $I_n+\ I_{n-2}$ is equal to

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

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. The value of $\lim_{n\to\infty}\left[\frac{1}{n+1}+\frac{1}{n+2}+\cdots\ldots\ldots\ldots+\frac{1}{n+n}\right]$ is

(1) $ln\,5$ (2) $ln\,2$ (3) $ln\,3$ (4) $\frac{\pi}{4}$

45. The equation of the lines joining the vertex of the parabola $y^2=6x$ to the point on it which have abscissa 24 are

(1) $y\pm 2x=0$ (2) $2y\pm x=0$ (3) $x\pm 2y=0$ (4) $2x\pm y=0$

46. Which of the following is not a logical statement

(1) Two non-empty sets have always a non-empty intersection
(2) Two real number n is less than 2
(3) Two individuals are always related
(4) None of these

47. The number of proper subsets of a set having $n+1$ elements is

(1) 2^{n+1} (2) $2^{n+1}-1$ (3) $2^{n+1}-2$ (4) 2^{n-2}

48. The value of $\frac{\tan 330^0 sec240^0 sin300^0}{\tan 135^0 sin210^0 sec315^0}$

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

49. 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

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. If $sin(120-A)=sin(120-B)$ and $0<A,B<\pi$ then all the values of A, B are

given by

(1) $A+B=\frac{\pi}{3}$ (2) $A=B\ or\ A+B=\frac{\pi}{3}$ (3) $A=B$ (4) $A+B=0$

52. If are $\vec{a}$ and $\vec{b}$ two vectors of magnitude 2, each inclined at an angle 60^0, then angle between $\vec{a}$ and $\vec{a}+\vec{b}$ is

(1) 30^0 (2) 45^0 (3) 60^0 (4) 90^0

53. Find the distance of a point (1, 2, 3) from the plane $3y+4z+4=0$

(1) 4.4 (2) 4 (3) 4.04 (4) 4.44

54. AB and CD are 2 line segments, where $A(2,3,0)$, $B(6,9,0)$, $C(-6,-9,0)$. P and Q are midpoint of AB and CD, respectively and L is the midpoint of PQ. Find the distance of L from the plane $3x+4z+25=0$

(1) 25 (2) 15 (3) 5 (4) 40

55. Determine the plane through the intersection of the planes $x+2y+3z-4=0$ and $2x+y-z+5=0$ and perpendicular to the plane $5x+3y+6z+8=0$

(1) $-51x-15y-50z-173=0$ (2) $51x+15y-50z+173=0$

(3) $51x-15y+50z-173=0$ (4) $51x+50y+15z+173=0$

56. If α,β,γ are the roots of $x^3+a^2x+b=0$ then the value of $\begin{vmatrix}\alpha & \beta & \gamma\\ \beta & \gamma & \alpha\\ \gamma & \alpha & \beta\end{vmatrix}$ is

(1) $-a^3$ (2) a^3-3b (3) a^3 (4) 0

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. If $y=\tan^{-1}\left(\frac{a-x}{1+ax}\right)$ then $\frac{dy}{dx}=$

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

59. The point on the circle $x^2 + y^2 = 2$ at which abscissa and ordinate increase at the same rate is

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

60. A spherical ballon is being inflated at the rate of 35cc per minute. When its radius is 7 cm, its surface area increases at the rate of

(1) 10 sq. cm/min (2) 15 sq. cm/min (3) 20 sq. cm/min (4) 25 sq. cm/min