Mathematics- Model Question Paper

1. The function $f(x) = \log\left(x + \sqrt{x^2+1}\right)$ is

(1) an even function
(2)a periodic function
(3) an odd function
(4)neither an even nor an odd function

2. Let R = {(1,3), (4,2), (2,4), (2,3), (3,1)} be a relation on the set A = {1,2,3,4}. Then the relation R is

(1) a function (2) transitive (3) not symmetric (4) reflexive

3. If f:R $\rightarrow$ S, defined by f(x) = sinx - $\sqrt{3}\cos x + 1$ then the interval of S is

(1) [0,3] (2) [-1,1] (3) {0,1] (4) [-1,3]

4. The argument of -1- i is

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

5. The modulus of z=1 + cosθ + isinθ is

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

6. If $x^2 + y^2 = 1$ then $\frac{1+x+iy}{1+x-iy}$ is

(1) x-iy (2) –x-iy (3) –x + iy (4) x + iy

7. If 1 – i is a root of equation x^2 + ax + b = 0 then the values of a and b are respectively

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

8. The product of the matrices $\begin{bmatrix}7 & 5 & 3\end{bmatrix}\begin{bmatrix}7\\3\\2\end{bmatrix}$ is equal to

(1) 70 (2) [49] (3) [15] (4) [70]

9. If A is a square matrix of order 3 then [kA] is

(1) $k|A|$ (2) $-k|A|$ (3) $k^3|A|$ (4) $-k^3|A|$

10. If A is a scalar matrix with scalar k # 0, of order 3, then A^{-1} is

(1) $\frac{1}{k^2}I$ (2) $\frac{1}{k^3}I$ (3) $\frac{1}{k}I$ (4) kI

11. If I is the unit matrix of order n, where k # 0 is a constant, the adj(kI) =

(1) k^n (adj I) (2) k (adj I) (3) k^2(adj I) (4) k^{n-1}(adj I)

12. If nPr = 720 nCr, then the value of r is

(1) 6 (2) 5 (3) 4 (4) 7

13. How many triangles can be formed by joining the vertices of a hexagon?

(1) 120 (2) 60 (3) 20 (4) 10

14. If $A = \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$ and I = $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ **then which one of the following holds for all n≥1, by the principle of mathematical induction**

(1) $A^n = nA + (n-1)I$ (2) $A^n = nA - (n-1)I$

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

15. The sum of the coefficients in the expansion of $(1-x)^{10}$ is

(1) 0 (2) 1 (3) 10^2 (4) 1024

16. The total number of terms in the expansion of $[(a+b)^2]^{18}$ is

(1) 11 (2) 36 (3) 37 (4) 35

17. If the n^{th} term of an A.P. is (2n-1), then the sum of n terms is

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

18. What number must be added to 5, 13 and 29 so that sum may from a G.P.?

(1) 2 (2) 3 (3) 4 (4) 5

19. $\text{Lim}_{x\to 1}\dfrac{x^{1/3}-1}{x-1}$ is

$(1)\dfrac{2}{3}$ $(2)-\dfrac{2}{3}$ $(3)\dfrac{1}{3}$ $(4)-\dfrac{1}{3}$

20. $f(x)=|x|+|x-1|$ is

(1) continuous at x = 0 only

(2) continuous at x = 1 only

(3) continuous at both x = 0 and x = 1

(4) discontinuous at x = 0,1

21. The c of Lagrange's Mean Value theorem for the function
$f(x)=x^2+2x-1;$ a=0,b=1 is

(1) – 1 (2) 1 (3) 0 (4) 0.5

22. At x =0 the function f(x) = $|x|$ **has**

(1) neither maximum nor minimum

(2) minimum

(3) maximum

(4) point of inflexion

23. The equation of the tangent to the curve $y=\dfrac{x^3}{5}$ at the point $\left(-1,-\dfrac{1}{5}\right)$ is

(1) 5y + 3x = 2 (2) 5y – 3x = 2 (3) 3x – 5y = 2 (4) 3x + 3y = 2

24. $\int\dfrac{dx}{a^2-x^2}$ is

$(1)\dfrac{1}{2a}\log\left(\dfrac{a+x}{a-x}\right)+c$ $(2)\dfrac{1}{2a}\log\left(\dfrac{x-a}{x+a}\right)+c$

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

25. $\int \frac{e^x}{e^{x+1}} dx$ is

(1) $\frac{x}{2} + c$ (2) $\frac{1}{2}\left(\frac{e^x}{e^x+1}\right)^2 + c$ (3) $\log\left(e^x+1\right) + c$ (4) $x + e^x + c$

26. The value of $\int_0^1 x(1-x)^4 dx$ is

(1) $\frac{1}{12}$ (2) $\frac{1}{30}$ (3) $\frac{1}{24}$ (4) $\frac{1}{20}$

27. The value of $\int_0^{\pi/4} \cos^3 2x \, dx$ is

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

28. The area bounded by the line y = x, the x-axis, the ordinates x = 1, x = 2 is

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

29. The degree of the differential equation $\sqrt{1+\left(\frac{dy}{dx}\right)^{1/2}} = \frac{d^2y}{dx^2}$

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

30. The differential equation of all non-vertical lines in plane is

(1) $\frac{dy}{dx} = 0$ (2) $\frac{d^2y}{dx^2} = 0$ (3) $\frac{dy}{dx} = m$ (4) $\frac{d^2y}{dx^2} = m$

31. The integrating factor of $\frac{dy}{dx} + 2\frac{y}{x} = e^{4x}$ is

(1) log x (2) x^2 (3) e^x (4) x

32. Solution of $\frac{dy}{dx} + mx = 0,$ where m <0 i

(1) $x=ce^{my}$ (2) $x=ce^{-my}$ (3) x=my+c (4) x=c

33. The length of the diameter of a circle with centre (2,1) and passing through the point (-2,1) is

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

34. The slop of the straight line 2x-3y+1 =0 is

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

35. If 2x+3y=0 and 3x-2y=0 are the equations of two diameters of a circle, then its centre is

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

36. The line 4x+2y=c is a tangent t the parabola y^2 =16x then c is

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

37. The line 5x-2y+4k =0 is a tangent to $4x^2-y^2$ =36 then k is

(1) $\frac{4}{9}$ (2) $\frac{2}{3}$ (3) $\frac{9}{4}$ (4) $\frac{81}{16}$

38. The lines $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{-k}$ and $\frac{x-1}{k} = \frac{y-4}{2} = \frac{z-5}{1}$ **are coplanar if**

(1) k=0 or -1 (2) k=0 or -3 (3) k=3 or -3 (4) k =3 or -1

39. The two lines x=ay+b,z=cy +d and x=a'y+b', z=c'y +d' will be perpendicular if and only if

(1) aa'+bb'+cc'+1 =0 (3) aa'+bb'+cc'=0

(2)(a+a')(b+b')+(c+c') =0 (4) aa'+cc'+1 =0

40. The angle between the lines 2x=3y=-z and 6x=-y=-4z is

(1) 45° (2) 30° (3) 0° (4) 90°

41. If a **is a nonzero vector and k is a scalar such that** $|ka|$ **=1 then k is equal to**

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

42. If $mi+2j+k$ and $4i-9j+2k$ **are perpendicular then m is**

(1) -4 (2) 8 (3) 4 (4) 12

43. If $|a|=3,|b|=4$ and $a.b=9$ then $|a\times b|$ **is**

(1) $3\sqrt{7}$ (2) 63 (3) 69 (4) $\sqrt{69}$

44. If in frequency distribution the mean and median are 21 and 22 respectively then its median is approximately

(1) 25.5 (2) 24 (3) 22 (4) 20.5

45. If $f(x)=\begin{cases}Kx^2 & 0<x<3\\ 0 & .\text{elsewhere}\end{cases}$ **is probability density function then the value of k is**

(1) $\frac{1}{3}$ (2) $\frac{1}{6}$ (3) $\frac{1}{9}$ (4) $\frac{1}{12}$

46. A trigonometric equation $\sin^{-1}x=2\sin^{-1}$ **a has solution for**

(1) $|a|<\frac{1}{\sqrt{2}}$ (2)all real values of a (3) $|a|<\frac{1}{2}$ (4) $|a|\geq\frac{1}{2}$

47. A person standing on the bank of a river observes that the angle of elevation of the top of a tree on the opposite band of the river is 60° and when he retires 40 meters away from the tree the angle of the elevation becomes 30°, then the breadth of the river is

(1) 20m (2) 30 m (3) 40m (4) 60m

48. If $\sin^{-1}\left(\frac{x}{5}\right)+\operatorname{cosec}^{-1}\left(\frac{5}{4}\right)=\frac{\pi}{2}$ **then the values of x is**

(1) 4 (2) 5 (3) 1 (4) 3

49. p↔q is equivalent to

(1) p →q (2) q→p (3) (p→q)v(q→p) (4) (p→q)^(q→p)

50. Which of the following is a tautology?

(1) p∨q (2) p ∧ q (3) p∨(~p) (4) p ∧(~p)

Answers

Q.NO	OPTION	Q.NO	OPTION
1	3	26	2
2	3	27	2
3	4	28	1
4	3	29	4
5	4	30	2
6	4	31	2
7	2	32	2
8	4	33	2
9	3	34	3
10	3	35	3
11	4	36	4

12	1	37	3
13	3	38	2
14	2	39	4
15	1	40	4
16	3	41	4
17	3	42	3
18	2	43	1
19	3	44	2
20	3	45	3
21	4	46	1
22	2	47	1
23	2	48	4
24	1	49	4
25	3	50	3