Mathematics-Model Question Paper

1. [BT:C] The function $f(x) = \log(x + \sqrt{x^2 + 1}$ is
    (A) an even function   (B) a periodic function
    (B) an odd function   (D)neither an even nor an odd function

2. [BT:K] 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

    (A) a function   (B) transitive   (C) not symmetric   (D) reflexive

3. [BT:K] If $f: \mathbb{R} \to S$ is defined by $f(x) = \sin x - \sqrt{3} \cos x + 1$ then interval of S is

    (A) [0,3]   (B) [-1,1]   (C) {0,1]   (D) [-1,3]

4. [BT:K] The argument of $-1 - i$ is

    (A) $\dfrac{\pi}{4}$ (B) $\dfrac{3\pi}{4}$ (C) $-\dfrac{3\pi}{4}$ (D) $-\dfrac{\pi}{4}$

5. [BT:K] The modulus of $z = 1 + \cos\theta + i \sin\theta$ is

    (A) $\sqrt{2}$ (B) $\sqrt{2} \sin\theta$ (c) $\sqrt{3}$ (D) $2 \cos\dfrac{\theta}{2}$

6. [BT:C]   If $x^2 + y^2 = 1$ then $\dfrac{1+x+iy}{1+x-iy}$ is

    (A) $x-iy$ (B) $-x-iy$ (C) $-x + iy$ (D) $x + iy$

7. [BT:A] If $1 - i$ is a root of equation $x^2 + ax + b = 0$ then the values of a and b are
    respectively
    (A) 2,1   (B) -2,2   (C) 2,2   (D) 2, -2

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

    (A) 70   (B) [49]   (C) [15]   (D) [70]

9. [BT:K] If A is a square matrix of order 3 then $|kA|$ is

    (A) $k|A|$ (B) $-k|A|$ (C) $k^3 |A|$ (D) $-k^3|A|$

10. [BT:K]   If A is a scalar matrix with scalar $k \neq 0$, of order 3, then A^{-1} is

    (A) $\dfrac{1}{k^2} I$ (B) $\dfrac{1}{k^3} I$ (C) $\dfrac{1}{k} I$ (D) $k I$

11. [BT:K]   If I is the unit matrix of order n, where $k \neq 0$ is a constant, the $adj(kI) =$

   (A) k^n (adj I)   (B) k (adj I)   (C) k^2(adj I)   (D) k^{n-1}(adj I)

12. [BT:C]   If $nPr = 720 \, nCr$, then the value of r is

   (A) 6   (B) 5   (C) 4   (D) 7

13. [BT:K] How many triangles can be formed by joining the vertices of a hexagon?

   (A) 120   (B) 60   (C) 20   (D) 10

14. [BT:A] If $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 10 & 1 \end{bmatrix}$ then which one of the following holds for all $n \int 1$, by the principle of mathematical induction

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

   (C) $A^n = 2^{n-1}A + (n-1)I$ (D) $A^n = 2^{n-1}A - (n-1)I$

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

   (A) 0   (B) 1   (C) 10^2 (D) 1024

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

   (A) 11   (B) 36   (C) 37   (D) 35

17. [BT:C] If the nth term of an A.P. is $(2n-1)$, then the sum of n terms is

   (A) $n^2 - 1$ (B) $(2n - 1)$ (C) n^2 (D) $n^2 + 1$

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

   (A) 2   (B) 3   (C) 4   (D) 5

19. [BT:C]   The value of $\lim_{x \to 1} \frac{x^{1/3}-1}{x-1}$ is

   (A) 2/3   (B) –2/3   (c) 1/3   (D) –1/3

20. [BT:K]   The function $f(x) = |x| + |x - 1|$ is
(A) continuous at $x = 0$ only   (C) continuous at both $x = 0$ and $x = 1$
(B) continuous at $x = 1$ only   (D) discontinuous at $x = 0,1$

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

(A) -1 (B) 1   (C) 0   (D) 0.5

22. [BT:K]   At $x = 0$ the function $f(x) = |x|$ has

(A) neither maximum nor minimum   (C) maximum
(B) minimum   (D) point of inflexion

23. [BT:C] The equation of the tangent to the curve $y = \frac{x^3}{5}$ at $(-1, -1/5)$ is
(A) $5y + 3x = 2$ (B) $5y - 3x = 2$ (C) $3x - 5y = 2$ (D) $3x + 3y = 2$

24. [BT:C] The value of $\int \frac{dx}{a^2 - x^2}$ is
(A) $\frac{1}{2a} \log\left(\frac{a+x}{a-x}\right) + c$ (B) $\frac{1}{2a} \log\left(\frac{x-a}{x+a}\right) + c$

(C) $\frac{1}{a} \tan^{-1} \frac{x}{a} + c$ (D) $\frac{1}{2a} \tan^{-1} \frac{x}{a} + c$

25. [BT:C]   The value of $\int 2^x \, dx$ equals

(A) $\frac{2^{x+1}}{x+1} + c$ (B) $\frac{2^x}{\log 2} + c$ (C) $2^x \log 2 + c$ (D) $2^{x-1} \log 2 + c$

26. [BT:A] The value of $\int_0^1 x(1 - x)^4 dx$ is

(A)   1/12   (B) 1/30   (C) 1/24   (D) 1/20

27. [BT:C]   The value of $\int_0^{2\pi} \cos^3 2x \, dx$ is

(A) 2/3   (B) 1/3   (C) 0   (D) $2\pi/3$

28. [BT:K] The area bounded by the line $y = x$, the x-axis, the ordinates $x = 1$, $x = 2$ is

(A)   3/2   (B) 5/2   (C) 1/2   (D) 7/2

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

(A) 1   (B) 2   (C) 4   (D) 6

30. [BT:K] The differential equation of all non-vertical lines in plane is

(A) $\frac{dy}{dx} = 0$ (B) $\frac{d^2y}{dx^2} = 0$ (C) $\frac{dy}{dx} = m$ (D) $\frac{d^2y}{dx^2} = m$

31. [BT:K] The integrating factor of $\frac{dy}{dx} + 2\frac{y}{x} = e^{4x}$ is
(A) log x (B) x^2 (C) e^x (D) x

32. [BT:K] Solution of $\frac{dx}{dy} + mx = 0$ where $m < 0$ is
(A) $x=ce^{my}$ (B) $x=ce^{-my}$ (C) $x=my+c$ (D) $x=c$

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

(A) 4   (B) 8   (C) $4\sqrt{5}$ (D) 2

34. [BT:K] The slop of the straight line $2x-3y+1 =0$ is

(A)   - 2/3   (B) – 3/2   (C) 2/3   (D) 3/2

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

(A) (1, -2)   (B) (2,3)   (C) (0,0)   (D) (-3,2)

36. [BT:K] The eccentricity of the rectangular hyperbola is
(A) 1   (B) $\sqrt{2}$ (C) 2   (D) $2\sqrt{2}$

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

(A)   4/9   (B) 2/3   (C) 9/4   (D) 81/16

38. [BT:C] 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

(A) k=0 or -1   (B) k=0 or -3   (C) k=3 or -3   (D) k =3 or -1

39. [BT:K]   The conjugate lines through a focus of an ellipse are at an angle

(A) 30° (B) 45° (C) 60° (D) 90°

40. [BT:C]   A line makes an angle of 45º with OX and 60º with OY, what (acute) angle does it make with OZ?

(A) 60°   (B) 45°   (C) 30°   (D) 80°

41. [BT:K] If $\vec{a}$ is a nonzero vector and k is a scalar such that $|k\vec{a}|=1$ then k is equal to

(A) $|\vec{a}|$ (B) 1   (C) $\frac{1}{|\vec{a}|}$ (D) $\pm\frac{1}{|\vec{a}|}$

42. [BT:C] If $m\vec{i}+2\vec{j}+\vec{k}$ and $4\vec{i}-9\vec{j}+2\vec{k}$ are perpendicular then m is

(A) -4 (B) 8   (C) 4   (D) 12

43. [BT:C] If $|\vec{a}|=3$, $|\vec{b}|=4$ and $\vec{a}\circ\vec{b}=9$ then $|\vec{a}\times\vec{b}|$ is

(A) $3\sqrt{7}$ (B) 63   (C) 69   (D) $\sqrt{69}$

44. [BT:A] The value of $(\vec{a}\times\vec{b})^2$ is

(A) $\vec{a}^2\vec{b}^2-(\vec{a}\cdot\vec{b})^2$ (B) $\vec{a}^2+\vec{b}^2+2(\vec{a}^2\cdot\vec{b}^2)$

(C) $(\vec{a}^2)(\vec{b}^2)$ (D) $\vec{a}^2\,\vec{b}^2\cos\theta$

45. [BT:C] If $f(x)=\begin{cases}kx^2, & 0<x<3 \\ 0, & \text{otherwise}\end{cases}$ is the probability density function then the value of k is

(A) $1/3$ (B) $1/6$ (C) $1/9$ (D) $1/12$

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

(A) $|a|<\frac{1}{\sqrt{2}}$ (B) all real values of a.   (C) $|a|<\frac{1}{2}$ (D) $|a|>\frac{1}{2}$.

47. [BT:A] 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

(A) $20m$ (B) $30\ m$ (C) $40\ m$ (D) $60\ m$

48. [BT:C] A random variable X has the following probability mass function:
$P(X=-2)=k/6$, $P(X=3)=k/4$ and $P(X=1)=k/12$. Then the value of k is

(A) 1   (B) 2   (C) 3   (D) 4

49 [BT:C] A box contains 6 red and 4 white balls. If 3 balls are drawn at random, the probability of getting 2 white balls is

(A) $1/20$ (B) $18/125$ (C) $4/25$ (D) $3/10$

50. [BT:C] If the mean and standard deviation of a binomial distribution with parameters n and p are 12 and 2 respectively. Then the value of p is

(A) $1/2$ (B) $1/3$ (C) $2/3$ (D) $1/4$

Answers(Mathematics)

1(D)	2(C)	3(B)	4(D)	5(D)	6(D)	7(B)	8(D)	9(C)	10(B)
11(B)	12(A)	13(C)	14(B)	15(A)	16(C)	17(C)	18(B)	19(C)	20(C)
21(D)	22(A)	23(B)	24(A)	25(B)	26(B)	27(B)	28(A)	29(C)	30(C)
31(B)	32(B)	33(B)	34(C)	35(C)	36(B)	37(C)	38(B)	39(D)	40(A)
41(D)	42(C)	43(A)	44(A)	45(C)	46(C)	47(A)	48(B)	49(D)	50(C)