+2- MATHEMATICS

1. The value of the integral $\int \frac{1+\ln x}{4+x\ln x}dx$ is

(A) $4+x\ln x+c$ (B) $\ln(4+x\ln x)+c$

(C) $\ln(3+x\ln x)+c$ (D) None of these

2. Value of the definite integral $\int_2^4 \frac{|x|}{x}dx$ is

(A) -2 (B) 4 (C) 0 (D) 2

3. The value of the integral $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{dx}{e^{\sin x}+1}$

(A) 0 (B) 1 (C) $\frac{\pi}{2}$ (D) $-\frac{\pi}{2}$

4. The area bounded by the curve $y=2x-x^2$ and the line $y=-2x$ is

(A) 1 (B) $\frac{9}{2}$ (C) $\frac{32}{3}$ (D) 8

5. $\frac{d}{dx}\int_2^{x^2} \frac{dt}{\ln t}$ is equal to

(A) $2\ln x$ (B) $\ln x$ (C) $2x\ln x$ (D) None of these

6. The value of the integral $\int \frac{\sin^2 x}{\cos^6 x}dx$ is

(A) $\frac{\tan^2 x}{3}+\frac{\tan^5 x}{5}+c$ (B) $\frac{\tan^3 x}{4}+\frac{\tan^6 x}{7}+c$

(C) $\frac{\tan^4 x}{5}+\frac{\tan^7 x}{8}+c$ (D) $\frac{\tan^3 x}{4}+\frac{\tan^5 x}{7}+c$

7. The domain of the function $\sqrt{x^2-x-2}+\frac{1}{\sqrt{3-2x-x^2}}$ is

(A) $[2,3)$ (B) $(2,3]$ (C) $(2,3)$ (D) $(1,3)$

8. $\lim_{x\to\infty}\left(\frac{x^3}{3x-4}-\frac{x^2}{3x+2}\right)$ is equal to

(A) $\frac{2}{9}$ (B) $\frac{4}{9}$ (C) $\frac{5}{9}$ (D) $\frac{3}{9}$

9. Given the function $f(x)=\frac{1}{1-x}$. The points of discontinuity of the composite function $y=f(f(f(x)))$ is

(A) $x=0$ (B) $x=1$ (C) $x=-1$ (D) None of these

10. Let $f(x)=\begin{cases} x^2 & if\ x\le 2 \\ ax+b & if\ x>2 \end{cases}$

Then the coefficients a and b at which the function is continuous and has a derivative at $x=2$ is

(A) $a=4,b=-2$ (B) $a=4,b=-4$

(C) $a=-4,b=2$ (D) a = 4, b = 4

11. The derivative of the function $y=3x|x|$ at $x=0$

(A) 0 (B) does not exist (C) +3 (D) –3

12. If $e^x\sin y-e^y\cos x=0$, then the value of $y'|_{(0,0)}$ is

(A) 2 (B) 1 (C) 0 (D) None of these

13. The minimum value of the function $f(x)=2x^3-15x^2-84x+8$ occurs at

(A) $x=2$ (B) $x=-2$ (C) $x=7$ (D) -7

14. The equation of the tangent to the curve $4x^3-3xy^2+6x^2-5xy-8y^2+9x+14=0$ at the point $(-2,3)$ is

(A) $9x+2y+12=0$ (B) $7x+3y+5=0$

(C) $3y+4x-1=0$ (D) 4 x + 3 y +3 = 0

15. If $f(x,y)=\frac{xy}{x^2+y^2}$, then xf_x+yf_y is equal to

(A) 0 (B) 1 (C) $\frac{2xy}{x^2+y^2}$ (D) 2

16. General solution of the differential equation $\frac{d^2y}{dx^2} = xe^x$ is

(A) $xe^x + 2e^x + c_1x + c_2$ (B) $xe^x - 2e^x + c_1x + c_2$

(C) $xe^x + cx + d$ (D) None of these

17. The order and degree of the differential equation $(1+y'^2)^{\frac{2}{3}} = y''$ is

(A) $2,2$ (B) $3,2$ (C) $2,3$ (D) 2, 4

18. The value of $\lim_{x\to 0} \frac{e^{x^2}-1}{\sin^2 x}$ is

a) 0
b) 1/2
c) 1
d) 2

19. The value of α such that $\hat{i} + 2\hat{j} + 3\hat{k}$, $4\hat{i} + \hat{j} + 5\hat{k}$ and $5\hat{i} - 4\hat{j} + \alpha\hat{k}$ are coplanar is

(A) 0 (B) 1 (C) 2 (D) 4

20. The angle between the two lines whose direction of ratios (r.s) are $4, \sqrt{3}-1, -\sqrt{3}-1$ and $2,1,1$ respectively is

(A) 60° (B) 45° (C) 90° (D) 30^o

21. The term independent of x in $\left(2x^2 - \frac{1}{x}\right)^6$ is

(A) 40 (B) 60 (C) 50 (D) 70

22. If a sphere is drawn about the line segment XY as diameter where X and Y are the points $(1,2,3)$ and $(-1,1,1)$ respectively. Then the equation of the sphere is

(A) $x^2 + y^2 + z^2 - 3y + 4z + 4 = 0$ (B) $x^2 + y^2 + z^2 + 3y - 4z + 4 = 0$

(C) $x^2 + y^2 + z^2 + 3y + 4z - 4 = 0$ (D) None of these

23. The plane $5x - y + 4 = 0$ is parallel to

(A) $xz-$plane (B) $zx-$plane (C) $yz-$plane (D) $z-$axis

24. The perpendicular distance between two lines $4x-3y+6=0$ and $8x-6y+2=0$ is

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

25. The angle between the pairs of lines $7x^2+5xy-7y^2=0$ is

(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{2}$ (D) $\frac{2\pi}{3}$

26. If the circle passes through origin and cuts off intercepts 2 and 3 from the axes. Then its equation is

(A) $x^2+y^2-2x-3y=0$ (B) $x^2+y^2+2x+3y=0$

(C) $x^2+y^2-4x-6y=0$ (D) None of these

27. If the parabola whose focus is at $(6,0)$ and directrix $x=-6$, then its equation is

(A) $x^2=6y$ (B) $y^2=24x$ (C) $x^2=-6y$ (D) $y^2=-24x$

28. The eccentricity of the ellipse $9x^2+16y^2=576$ is

(A) $\frac{4}{3}$ (B) $\sqrt{7}$ (C) $\frac{\sqrt{7}}{4}$ (D) 7

29. The value of c for which the line $y=2x+c$ is a tangent to the parabola $y^2=8x$ is

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

30. The binary equivalent of 51 is

(A) 101101 (B) 101001 (C) 110101 (D) 110011

31. If the matrix X is both symmetric and skew symmetric, then

(A) X is a diagonal matrix (B) X is zero matrix

(C) X is a square matrix (D) X can not be a matrix

32. The value of the determinant: $\begin{vmatrix} 1 & 2 & 3 \\ -1 & -2 & -3 \\ 3 & 5 & 7 \end{vmatrix}$ is

(A) 27 (B) 9 (C) 3 (D) 0

33. The value of α and β for which the system of equations

$$\alpha x + y + 2z = 0$$
$$x + 2y + z = \beta$$
$$2x + y + \alpha z = 0$$

has no solution is

(A) $\alpha = -1$, $\beta = 0$ (B) $\alpha = -1$, $\beta \neq 0$

(C) $\alpha = 2$, $\beta = 0$ (D) $\alpha = -1$, $\beta = -1$

34. The cofactor of 3 in the determinant

$$\begin{vmatrix} 1 & 2 & 3 \\ -2 & 1 & -4 \\ 1 & 0 & 2 \end{vmatrix}$$

(A) 0 (B) 1 (C) -1 (D) 4

35. The minimum value of the rational function $y = \dfrac{x^2 - x + 1}{x^2 + x + 1}$ is

(A) $\dfrac{1}{2}$ (B) $\dfrac{1}{3}$ (C) $\dfrac{1}{4}$ (D) 1

36. The condition on λ so that the quadratic function
$p(x) = x^2 - 4x + 2 + \lambda(x-4)^2$ is always positive for $x \in \square$ is

(A) $\lambda = 1$ (B) $\lambda = 0$ (C) $\lambda > 1$ (D) None of these

37. If $ax^2 + bx^2 + c$ vanishes at $x = 1, 2, 3$, then values of a, b and c are

(A) $1, -1, 1$ (B) $-1, 1, 1$ (C) $0, 0, 0$ (D) -1, -1, -1

38. The sum of the infinite series $1 + \dfrac{1}{\lfloor 2} + \dfrac{1}{\lfloor 4} + \dfrac{1}{\lfloor 6} + ...$ is

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

39. The mean deviation about the mean for the following data $4,7,8,9,10,12,13,17$ is

(A) 4 (B) 9 (C) 3 (D) 7

40. The solution of the differential equation $\sin\left(\frac{dy}{dx}\right)=a,\ a\in\square$; $y=3$ when $x=0$ is

(A) $\cos\left(\frac{y-3}{x}\right)=a$ (B) $\cos\left(\frac{x-3}{y}\right)=a$

(C) $\sin\left(\frac{y-3}{x}\right)=a$ (D) $\sin\left(\frac{x-3}{y}\right)=a$

41. The solution of the differential equation $\frac{dy}{dx}-e^{-x}=0$, when $y(0)=1$ is

(A) $y=e^{-x}+1$ (B) $y=-e^{-x}-2$ (C) $y=-e^{-x}+2$ (D) None of these

42. 4 boys and 4 girls sit in a row randomly. The probability that all 4 girls sit together is

(A) $\frac{1}{14}$ (B) $\frac{1}{4}$ (C) $\frac{1}{12}$ (D) $\frac{1}{16}$

43. Two identical dice are rolled. The probability that the same number will not appear in each of them is

(A) $\frac{1}{6}$ (B) $\frac{1}{18}$ (C) $\frac{5}{6}$ (D) $\frac{5}{36}$

44. The number of numbers between 10000 and 100000 can be formed by using digits $1,3,4,5,6,8$ if no digits is to appear more than once in any number is

(A) 360 (B) 720 (C) 180 (D) 90

45. A school has 6 badminton players. A team of 4 has to be sent to a tournament. The number of ways the team can be selected is

(A) 24 (B) 12 (C) 18 (D) 15

46. The value of $6\left(\sin^6\theta+\cos^6\theta\right)-9\left(\sin^4\theta+\cos^4\theta\right)+2$ is

(A) -3 (B) 3 (C) -1 (D) 1

47. If x^2+x+1, $2x+1$ and x^2-1 are sides of a triangle, then the measure of largest angle is

(A) 135° (B) 105° (C) 120° (D) 145^o

48. The value of $\cot^{-1}\sin\cos^{-1}\sqrt{\frac{2}{3}}$ is

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

49. The number of solution of the equation $\cos 2x-\sin x=0$, $x\in(-\pi,\pi)$ is

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

50. If $\alpha+\beta+\gamma=\pi$ and $\cos\alpha=\cos\beta\cos\gamma$, then value of $\cot\beta\cot\gamma$ is

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

51. Which of the following is a statement ?

(A) What is your name? (B) $2+x=3$

(C) Listen to me (D) 17 is less than 1

52. Which of the following is true ?

(A) $\sim p$ and p have same truth value

(B) $p\vee q$ is true only when both p and q are true

(C) $p\Rightarrow q$ is true only when p is true but q is false

(D) None of these

53. If $X=\left\{x\in\square\,\middle|\,3x-2=0\right\}$ ($\square$ is the set of natural numbers), then $|X|=$

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

54. Which of the following is true for $X\setminus\left(X\cap Y\right)$

(A) X (B) Y (C) $X \cap Y'$ (D) X'

55. The relation $R = \{(a,a),(b,b),(c,c),(a,b)\}$ on the set $\{a,b,c\}$ is

(A) reflexive, symmetric but not transitive

(B) reflexive, transitive but not symmetric

(C) is an equivalence relation

(D) None of these

56. The function $f : \square \to \square$ (integers) given by $f(z) = 3n+1$ is

(A) bijective (B) onto (C) one -to-one (D) None of these

57. The graph of the function $f(x) = 3^x$ lies on

(A) 1^{st} quadrant (B) 1^{st} and 2^{nd} quadrant

(C) 1^{st} and 3^{rd} quadrant (D) 1^{st} and 24^{th} quadrant

58. If $f(x) = \dfrac{x}{\sqrt{1+x^2}}$ then $f((f(x)))$ is

(A) $\dfrac{x}{\sqrt{1+x^2}}$ (B) $\dfrac{x}{\sqrt{1+2x^2}}$

(C) $\dfrac{x}{\sqrt{1+3x^2}}$ (D) None of these

59. If α, β, γ are positive unequal real numbers then which of the following is correct

(A) $(\alpha+\beta)(\beta+\gamma)(\gamma+\alpha) < 4\alpha\beta\gamma$ (B) $(\alpha+\beta)(\beta+\gamma)(\gamma+\alpha) < 8\alpha\beta\gamma$

(C) $(\alpha+\beta)(\beta+\gamma)(\gamma+\alpha) > 8\alpha\beta\gamma$ (D) None of these

60. If ω is a complex cube root of unity, then $\omega^{3n+1} + \omega^{6n+2}$ (n is an integer) is equal to

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