ORIGINAL PAPER

1. If $y = \tan^{-1}\left\{\frac{1+x}{1-x}\right\}$, then $\frac{dy}{dx}$ is equal to .....
   (a) $\frac{2}{1+x^2}$ (b) $\frac{1}{1+2x^2}$
   (c) $\frac{1-x^2}{1+x^2}$ (d) $\frac{1}{1+x^2}$
2. If $y = \log(\tan x)$, then $\frac{dy}{dx}$ is equal to .....
   (a) $2\,\text{cosec}2x$ (b) $2\sec 2x$
   (c) $2\sin 2x$ (d) $2\cos 2x$
3. If $y = \cos^{-1} x$ and $z = \sin^{-1}\sqrt{1-x^2}$ then $\frac{dy}{dz}$ is equal to .....
   (a) $\frac{1}{1-x^2}$ (b) 1
   (c) $\frac{1}{1+x^2}$ (d) $\frac{x}{1-x^2}$
4. If $y = e^{2x}$, then $\frac{d^2y}{dx^2}.\frac{d^2x}{dy^2}$ is equal to .....
   (a) $-2e^x$ (b) $-2e^{2x}$
   (c) $-2e^{-2x}$ (d) $-2e^{-x}$
5. If $\sqrt{x+y}+\sqrt{y-x}=\sqrt{2}$, then $\frac{d^2y}{dx^2}$ is equal to .....
   (a) 1 (b) 2
   (c) 1/2 (d) -2
6. $\lim_{x\to 0}\frac{1-\cos x}{x^2}$ is equal to .....
   (a) 0 (b) $\frac{1}{2}$
   (c) $\frac{1}{4}$ (d) 1
7. $\lim_{x\to\infty}\left(x-\sqrt{x^2+x}\right)$ is equal to .....
   (a) $\frac{1}{2}$ (b) 1
   (c) -1 (d) $-\frac{1}{2}$
8. $\int \frac{dx}{x\log x\log(\log x)}$ is equal to .....
   (a) $\log x$ (b) $\log(\log x)$
   (c) $\log(\log(\log x))$ (d) $(\log(\log x))^2$
9. $\int x^x(1+\log x)\,dx$ is equal to .....
   (a) x^x (b) $x^x\log x$
   (c) $\frac{x^x}{\log x}$ (d) $\frac{x^x}{a+x}$
10. $\int_0^1 \frac{x}{(1-x)^{3/4}}\,dx$ is equal to .....
    (a) 12/5 (b) $-12/5$
    (c) 16/5 (d) $-16/5$
11. Let A and B are two disjoint subsets of a universal set E. The $(A\cup B)\cap B'$ is equal to
    (a) E (b) ϕ
    (c) A (d) B
12. $(A-B)-A$ is equal to .....
    (a) ϕ (b) A
    (c) B (d) $A\cap B$
13. Let 10 is the cardinality of set A. The number of bijective mapping from set A to itself is .....
    (a) 10 (b) 55
    (c) 100 (d) 3628800
14. Let n be a positive decimal integer. The number of digits in n is equal to ...
    (a) $\lceil\log_{10} n\rceil+1$ (b) $\lfloor\log_{10} n\rfloor+1$
    (c) $\lceil\log_{10} n\rceil$ (d) $\lfloor\log_{10} n\rfloor$
15. Let cardinality of the set A and B are 2 and 5 respectively. The number of relations from A to B is .....
    (a) 1024 (b) 1000
    (c) 1010 (d) 1025
16. Let $f: R\to R$, $g: R\to R$ be two functions given by $f(x)=2x-3$ and $g(x)=x/2$. The $(fog)^{-1}(x)$ is equal to .....
    (a) $\frac{x+3}{2}$ (b) $x+3$
    (c) $2x+3$ (d) $2x-4$
17. Let $f: R\to R$ is defined by $f(x)=x^2+5$, then value of $f^{-1}(4)$ is equal to .....
    (a) + 1 (b) − 1 (c) ϕ (d) 20
18. If $g: R\to R$ is defined by $g(x)=x^2-2$, then value of $g^{-1}(23)$ is equal to .....
    (a) ± 5 (b) 25 (c) ± 4 (d) 527
19. Let cardinality of A and B are 3 and 10 respectively. The number of one one functions from A to B is.....

(a) 2^{10} (b) 2^2 (c) 101 (d) 720

20. Let $A = \{1,2,3,4\}$ and $B = \{a, b\}$ are two sets. The number of subjective mappings from A to B is ...
(a) 14 (b) 16 (c) 2^8 (d) 8!

21. Let $z = \sqrt{3} + i$ be a complex number and $\bar{z}$ be its conjugate. The $|\arg z| + |\arg \bar{z}|$ is equal to .....
(a) $\frac{\pi}{3}$ (b) $\frac{2\pi}{3}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{4}$

22. The $\frac{(\sqrt{3}+i)^{17}}{(1-i)^{50}}$ is equal to .....
(a) $\frac{-1-\sqrt{3}i}{2^9}$ (b) $\frac{1+\sqrt{3}i}{2^9}$
(c) $\frac{-1-\sqrt{3}i}{2^8}$ (d) $\frac{1+\sqrt{3}i}{2^8}$

23. For which of the following value of x, the $\left(\frac{1+i}{1-i}\right)^x = 1$ is .....
(a) 29 (b) 35 (c) 34 **(d) 68**

24. If ω is a cube root of unity, then the value of $(1 - \omega - \omega^2)(1 + \omega^3)$ is .....
(a) 2 (b) 4 (c) ω (d) ω^2

25. Let zbe a complex number. Which of the following is a solution of $|z| - z = 1 + 2i$?
(a) $\frac{3}{2} + 2i$ **(b)** $2 - \frac{3}{2}i$
(c) $\frac{3}{2} - 2i$ (d) $2 + \frac{3}{2}i$

26. If $\sin\theta + cosec\theta = 1$, then $\sin^n\theta + cosec^n\theta$ is equal to .....
(a) 1 **(b)** 2 (c) 2^n **(d)** $2^n - 1$

27. The value of $\sin^6 x + \cos^6 x + 3\sin^2 x \cos^2 x$ is equal to .....
(a) 3 (b) 2 (c) 1 **(d) 0**

28. IF $x = a\cos^2\theta \sin\theta$ *and* $y = a\sin^2\theta \cos\theta$, then $(x^2 + y^2)^3$ is equal to .....
(a) a^2x^2 **(b)** $a^2x^2y^2$
(c) $a^2(y^2 - x^2)$ **(d)** $a^2(x^2 - y^2)$

29. The minimum value of $3\cos\theta + 4\sin\theta + 10$ is equal to
(a) 5 (b) 9 (c) 7 (d) 3

30. $\sin 6^0 \sin 42^0 \sin 66^0 \sin 78^0$ is equal to .....
(a) $\frac{1}{32}$ (b) $\frac{1}{16}$ (c) $\frac{1}{8}$ (d) $\frac{1}{4}$

31. If 20^{th} term of an AP is 30 and its 30^{th} term is 20, then the 10^{th} term is .....
(a) 40 (b) 10 (c) 20 (d) 30

32. Let sum of n terms of an AP is $2n(n-1)$, then the sum of their squares is .....
(a) $\frac{8n(n-1)(2n-1)}{3}$ (b) $\frac{8n(n-1)(2n-1)}{6}$
(c) $\frac{n(n+1)(2n+1)}{6}$ (d) $\frac{8n(n+1)(2n+1)}{3}$

33. For what value of x, the $\log_2(5.2^x + 1), \log_4(2^{1-x} + 1)$ and 1 are in AP ?
(a) $\log_2 5$ (b) $\log_5 2$
(c) $1 + \log_2 5$ (d) $1 - \log_2 5$

34. If the ratio of sum of m terms and n terms of an AP be $m^2 : n^2$, then the ratio of the m^{th} and n^{th} term will be .....
(a) $m : n$ (b) $2m - 1 : 2n - 1$
(c) $m + n : n + 1$ (d) $n : m$

35. The value of $9^{1/3} \times 9^{1/9} \times 9^{1/27} \times ... \infty$ is .....
(a) 3 (b) 9 (c) 1 (d) ∞

36. If α and $\beta$are the roots of equation $x^2 + px + p^2 + q = 0$, then the value $\alpha^2 + \alpha\beta + \beta^2$.....
(a) p (b) $-p$ (c) q (d) – q

37. If the roots of $x^2 - bx + c = 0$ are two consecutive numbers, then $b^2 - 4c$ is equal to .....
(a) 1 (b) 2 (c) 3 (d) 4

38. The number of the real roots of the equation $(x-1)^2 + (x-2)^2 + (x-3)^2 = 0$ is ...
(a) 0 (b) 1 (c) 2 (d) 3

39. If the roots of the equation $(b-c)x^2 + (c-a)x + (a-b) = 0$ be equals, then a, b, c are in ...
(a) HP (b) GP
(c) AP (d) None of these

40. If the equations $x^2 + 2x + 3\lambda = 0$ and $2x^2 + 3x + 5\lambda = 0$ have a non – zero common root, then λ is equal to .....
(a) 1 (b) – 1 (c) 2 (d) – 2

41. If $^nP_r = {}^nP_{r+1}$ *and* $^nC_r = {}^nC_{r-1}$, then (n, r) is ...
(a) (2,3) (b) (3,2)
(c) (4,3) (d) (3,4)

42. The number of arrangements of the letters of the word BANANA in which the two $N's$ do not appear adjacently is .....
(a) 40 (b) 60 (c) 80 (d) 100

43. The sum $(n+1)$ terms of the series $\frac{C_0}{2}-\frac{C_1}{3}+\frac{C_2}{4}-\frac{C_3}{5}+\cdots$ is ....
(a) $\frac{1}{n+1}$ (b) $\frac{1}{n+2}$
(c) $\frac{1}{n(n+1)}$ (d) $\frac{1}{(n+1)(n+2)}$

44. If ω is a cube root of unity , then $\begin{vmatrix} 1 & \omega & \omega^2 \\ 1 & \omega^2 & 1 \\ \omega & 1 & \omega^2 \end{vmatrix}$ is equal to ...
(a) ω (b) ω^2 (c) 0 (d) – 3

45. If $A=\begin{bmatrix} x & 2 \\ 2 & x \end{bmatrix}$ and $|A^2|=0$, then x is equal to ...
(a) ± 2 (b) ± 3 (c) 1 (d) 4

46. Let $\vec{A}=i-j+k, \vec{C}=-i-j$ be two vectors. Which of the following is the vector $\vec{B}$ such that $\vec{A}\times\vec{B}=\vec{C}$ and $\vec{A}.\vec{B}=1$?
(a) i (b) k (c) $-j$ (d) $i+j$

47. A point P on $y-$axis is equidistance from the points $A(-5,4)$ and $B=(3,-2)$. Its coordinate is
(a) $\left(0,\frac{3}{4}\right)$ (b) $\left(0,\frac{4}{3}\right)$
(c) $\left(0,\frac{3}{7}\right)$ (d) $\left(0,\frac{7}{3}\right)$

48. The area of the triangle with vertices $A(a,b+c)$, $B(b,c+a), C(c,a+b)$ is equal to ...
(a) 0 (b) $ab+bc+ca$
(c) $a+b+c$ (d) $a+b-c$

49. Two dices are thrown simultaneously. The probability of obtaining a total score of 5 is ...
(a) $\frac{1}{12}$ (b) $\frac{1}{36}$ (c) $\frac{1}{9}$ (d) $\frac{1}{8}$

50. Three of the six vertices of a regular hexagon are chosen at random. The probability that triangle formed with these chosen vertices is equilateral, equal to .....
(a) $\frac{1}{2}$ (b) $\frac{1}{10}$ (c) $\frac{1}{5}$ (d) $\frac{1}{20}$

51. Minimum number of two-input NAND gates used to perform the function of two-input OR gate is ...
(a) One (b) Two
(c) Three (d) Four

52. The time required for an electronic circuit to change its state is called .....
(a) Propagation time (b) Rise Time
(c) Decay Time (d) Changing Time

53. Which of the following is not equivalent to x?
(a) $x.x$ (b) $x+x$
(c) $x.1$ (d) $x+1$

54. Which of the following is a sequential circuit?
(a) Adder (b) Decoder
(c) Multiplexer (d) Flip Flop

55. Which of the following will be the number of output lines in a combinational circuit that takes input a two bit number and produce the output cube of it?
(a) 3 (b) 4 (c) 5 (d) 6

56. Which of the following is a web browser?
(a) Avira (b) TrustPort
(c) Opera (d) None of these

57. Which of the following is an operating system?
(a) Baidu (b) Symbian
(c) AVG (d) None of these

58. Which of the following is antivirus software?
(a) Symbian (b) Norton
(c) AVG (d) None of these

59. Which of the following is a web search engine?
(a) Opera (b) Symbian
(c) AVG (d) None of these

60. Which of the following is a social media website?
(a) Instagram (b) Norton
(c) Symbian (d) None of these

61. z/OS is a
(a) PC operating system
(b) Mainframe operating system
(c) Mobile operating system
(d) None of these

62. Which of the following is a mobile operating system?
(a) Palm operating system
(b) AVG
(c) BeOS
(d) None of these

63. Intel 8086 is a bit microprocessor.
(a) 4 (b) 8 (c) 16 (d) 32

64. Which of the following is mainframe computer?
(a) Vtech (b) Rabbit
(c) Dubna (d) IBM System/360