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Under the Guidence of

Amit Katiyar

Complete Notes

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1. $\lim_{x\to\frac{\pi}{4}} \frac{\sin x-\cos x}{x-\frac{\pi}{4}}$ is equal to
(a) 1 (b) 2
(c) $-\sqrt{2}$ (d) $\sqrt{2}$

2. $\lim_{x\to 0} \frac{\sqrt{x+h}-\sqrt{x}}{h}$ is equal to .....
(a) $\sqrt{x}$ (b) $\frac{1}{\sqrt{x}}$
(c) $2\sqrt{x}$ (d) $\frac{1}{2\sqrt{x}}$

3. If $\lim_{x\to a} \frac{a^x-x^a}{x^x-a^a} = -1$, then ' a' is equal to
(a) 0 (b) 1
(c) ∞ (d) -1

4. $\lim_{x\to a} \frac{x^{10}-a^{10}}{x^2-a^2}$ is equal to
(a) $10a^9$ (b) $5a^9$
(c) $5a^8$ (d) $10a^8$

5. $\lim_{x\to 1} \frac{x+x^2+\cdots+x^{10}-10}{5x-5}$ is equal to
(a) 55 (b) 11
(c) 10 (d) 2

6. $\int \frac{1+\log x}{x} dx$ is equal to ... ...
(a) $\frac{1}{2}(1+\log x)^2$ (b) $\frac{1}{2}(\log x)^2$
(c) $(1+\log x)^2$ (d) $(\log x)^2$

7. If $x > 0$, then $\int |x|^3 dx$ is equal to
(a) $-\frac{x^4}{4}$ (b) $\frac{x^4}{4}$
(c) $\frac{|x|^4}{4}$ (d) $|x|^4$

8. If $\int_0^{\pi/4} \sec^2 x \sin x dx = a+\sqrt{2}$, then ' a' ' is equal to
(a) 0 (b) 1
(c) -1 (d) 2

9. $\int_0^1 \frac{x}{(1-x)^{1/2}} dx$ is equal to
(a) $1/3$ (b) $-1/3$
(c) $-\frac{3}{4}$ (d) $-4/3$

10. $\int \sqrt{x} e^{\sqrt{x}} dx$ is equal to .....
(a) $(2x-4\sqrt{x}+4)e^{\sqrt{x}}$ (b) $(2x^2-4x+4)e^{\sqrt{x}}$
(c) $(2x-4)e^{\sqrt{x}}$ (d) $(2x^2-4)e^{\sqrt{x}}$

11. The value of $2\sin^2\theta \cdot \cos^2\theta(\sec^2\theta+\operatorname{cosec}^2\theta)$ is .....
(a) 1 (b) 2
(c) 4 (d) 0

12. If $\cos\theta+\sec\theta = 3$, then $\cos^2\theta+\sec^2\theta$ is.....
(a) 5 (b) 6
(c) 4 (d) 7

13. The value of $\tan 1^0 \cdot \tan 2^0 \cdot \tan 3^0 \ldots \ldots \tan 89^0$ is
(a) 1 (b) ∞
(c) 0 (d) $1/3$

14. If $\cos\theta+\cos^3\theta = \sin^2\theta$, then $\sin^6\theta-4\sin^4\theta+8\sin^2\theta$ is equal to
(a) 2 (b) 3
(c) 4 (d) 1

15. If $\cos^2\theta+\sec^2\theta = a$, then
(a) $a < 1$ (b) $a = 1$
(c) $2 > a > 1$ (d) $a \geq 2$

16. The amplitude of $\frac{1+i\sqrt{3}}{\sqrt{3}+i}$ is equal to
(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{2}$
(c) $\frac{\pi}{6}$ (d) π

17. If z be a complex number and $\bar{z}$ be its conjugate, then the number of solutions of the equation $z^2+2\bar{z}=0$ is
(a) 1 (b) 2
(c) 3 (d) 4

18. If z be a complex number, then one of the solution of the equation $z^2+|z|^2=0$ is....
(a) $2+3i$ (b) $3+2i$
(c) $4i$ (d) $3-4i$

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

20. Let cube root of unity are $1, \omega, \omega^2$ Which of the following is a cube root of equation $(x-1)^3+8=0$?
(a) 1 (b) $(1-\omega)$
(c) -1 (d) $(1-2\omega^2)$

21. If m^{th} term of an A.P. is n and its n^{th} term is m, then its 10^{th} term is
(a) $m+n-10$ (b) $m-n-10$
(c) $n-m-10$ (d) $m+n+10$

22. Let sum of n terms of an A.P. is $3n^2+5$. If T_n of this series is 159 , then n is equal to .....
(a) 12 (b) 2
(c) 27 (d) 36

23. If the roots of the equation $x^3-9x^2+23x-15=0$ are in A.P., then their common difference will be .....
(a) ± 1 (b) ± 2
(c) ± 4 (d) ± 3

24. If $\log_2(5.2^x+1), \log_4(2^{1-x}+1)$, and 1 are in A.P., then x will be equal to
(a) $\log_2 5$ (b) $1+\log_2 5$
(c) $1-\log_5 2$ (d) $1-\log_2 5$

25. If sum of n terms of a series is $3n^2+4n$, then the series is.....
(a) A.P. (b) G.P.
(c) H.P. (d) A.G.P.

26. If ${}^8C_r - {}^7C_3 = {}^7C_2$, then r is equal to ....
(a) 4 (b) 5
(c) 6 (d) 7

27. The number of arrangement of the letters of the word BANANA in which two N's do not appear adjacently is .....
(a) 40 (b) 50
(c) 60 (d) 70

28. The number of numbers greater than 23000 can be formed from the digits 1,2,3,4,5 ... .
(a) 80 (b) 90
(c) 120 (d) 150

29. The coefficient of x^8y^{10} in $(x+y)^{18}$ is ...
(a) 2^{18} (b) ${}^{18}P_{10}$
(c) ${}^{18}C_8$ (d) ${}^{18}C_{10}$

30. The coefficient of x^4 in expansion of $(1+x+x^2+x^3)^{11}$ is
(a) 900 (b) 990
(c) 999 (d) 1000

31. If A be a set of cardinality n, then number of one to one onto functions from set A to A is....
(a) 2^n (b) $n\,!$
(c) n^n (d) n^3

32. If f is a function from a finite set A having 10 elements to a finite set B having 5 elements, then the number of functions from A to B is .....
(a) 5^{10} (b) 50
(c) 10^5 (d) 105

33. If A and B are two sets, then $(A \cup B)' \cap B$ is equal to
(a) B (b) A
(c) ϕ (d) A − B

34. If $A = \{a,b,c\}$ and $B = \{a,b,d,e,f\}$ are two sets, the number of elements in $(A-B) \times (A \cap B)$ is ...
(a) 3 (b) 2
(c) 1 (d) 0

35. If A and B are two disjoint sets having 3 and 5 elements respectively, then power-set of $A \times (B-A)$ contains .....elements.
(a) 1 (b) 2^3
(c) 2^6 (d) 2^{15}

36. If $y = \tan^{-1}\left\{\frac{1+\tan x}{1-\tan x}\right\}$, then $\frac{dy}{dx}$ is equal to .....
(a) 1 (b) 0
(c) -1 (d) $\sec^2 x$

37. If $y = \log\tan\theta$, then $\frac{dy}{d\theta}$ is equal to .....
(a) $2\sec 2\theta$ (b) $2\sec^2\theta$
(c) $\sec\theta\,\mathrm{cosec}\,\theta$ (d) $2\,\mathrm{cosec}^2\theta$

38. If $\sqrt{x+y} + \sqrt{y-x} = a$, then $\frac{d^2y}{dx^2}$ is equal to ....
(a) $-2a$ (b) $2/a^2$
(c) $2/a$ (d) $2a$

39. If $y = x + e^x$, then $\frac{dx}{dy}$ is....
(a) e^x (b) $\frac{1}{(1+e^x)^2}$
(c) $\frac{1}{(1+e^x)}$ (d) $-\frac{1}{(1+e^x)}$

40. If $y = (x^x)^x$, then $\frac{dy}{dx}$ is equal to ....
(a) $xy + 2xy\log x$ (b) $xy + xy\log x$
(c) $xy + \log x$ (d) $y + 2xy\log x$

41. The points $A(12,8), b(-2,6)$ and $C(6,0)$ are the vertices of .....
(a) Right angled triangle
(b) Isosceles Triangle
(c) Straight Line
(d) Equilateral Triangle

42. If the point $P(x,y)$ be equidistant from the points $A(a+b, b-a)$ and $B(a-b, a+b)$, then ....
(a) $ax = by$ (b) $bx = ay$
(c) $xy = ab$ (d) $x + y = a + b$

43. The number of the lines that are parallel to $2x + 6y + 7 = 0$ and have an intercept of length 10 between the coordinate axes is.....
(a) 4 (b) 3
(c) 2 (d) 1

44. The four lines $ax \pm by \pm c = 0$ enclose a .....
(a) Square (b) Parallelogram
(c) Rectangle (d) Rhombus

45. The area bounded by the lines $y = |x| - 1$ and $y = -|x| + 1$ is .....square unit.
(a) 1 (b) 2
(c) 3 (d) 4

46. The number of vectors of unit length perpendiculars to vectors $\vec{a} = i + j$ and $\vec{b} = k + j$ is .....
(a) 1 (b) 2
(c) 3 (d) infinite

47. The angle between vectors $\vec{a} \times \vec{b}$ and $\vec{b} \times \vec{a}$ is....
(a) 0^0 (b) 45°
(c) 90° (d) 180°

48. Two dice are thrown. The probability that the sum of the numbers on two dices will be 7 is .....
(a) 5/36 (b) 1/36
(c) 1/6 (d) 8/36

49. A single letter is selected at random from the word "JAMIA". The probability that it is a vowel is ....
(a) 3/5 (b) 2/5
(c) 1/5 (d) 4/5

50. One die and a coin are tossed simultaneously. The probability of getting 6 on die and head on coin is ...
(a) $\frac{1}{3}$ (b) $\frac{1}{4}$ (c) $\frac{1}{12}$ (d) $\frac{1}{6}$

51. The $2's$ complement of the binary number $(10101000)_2$ is?
(a) $(01010111)_2$ (b) $(01011111)_2$
(c) $(01011000)_2$ (d) $(11111000)_2$

52. Which of the following is not a universal logic gate?
(a) NAND (b) NOR
(c) Both (a) and (b) (d) XNOR

53. Intel 8085 is a(n) bit microprocessor?
(a) 4 (b) 8
(c) 16 (d) 32

54. Which of the following is not a Web Browser?
(a) Ios (b) Internet Explorer
(c) Chrome (d) Safari

55. Which of the following CPU registers contains the address of next instruction during a program execution?
(a) Program Counter (b) Accumulator
(c) Index Register (d) Instruction Register

56. 1 Petabyte is equivalent to 1024
(a) Megabytes (b) Gigabytes
(c) Exabyte's (d) Terabytes

57. Which of the following is a Class-A IP address?
(a) 191.10 .50 .0 (b) 164.255 .10 .1
(c) 125.10 .10 .1 (d) 220.10 .10 .1

58. The default subnet mask for class-A IP address is
(a) 255.255 .255 .0 (b) 255.255 .0 .0
(c) 255.0 .0 .0 (d) 0.0.0.0

59. Which of the following IP address class is reserved for multicasting?
(a) Class – A (b) Clâss - B
(c) Class – C (d) Class - D

60. The number of links in a fully mashed network of N nodes is
(a) N (b) N^2
(c) $\frac{N(N-1)}{2}$ (d) $\frac{N(N+1)}{2}$

61. Which of the following is an example of Firmware?
(a) Operating System (b) Compiler
(c) BIOS (d) Word Processor

62. Which of the following memory works on the principle of the 'locality of reference'?
(a) Flash Memory (b) Associative Memory
(c) Cache Memory (d) Magnetic Tape

63. Which of the following categories of ROM allows data to be erased at byte-level?
(a) PROM (b) EPROM
(c) EEPROM (d) All of these

64. Who originated the concept of programmable computer, and considered as the 'father of the computer'?
(a) Bill Gates (b) Tim Berners - Lee
(c) Steve Jobs (d) Charles Babbage

65. Which of the following statements is false?
(a) Static RAM is faster than dynamic RAM.
(b) Static RAM uses transistors
(c) Dynamic RAM uses capacitors
(d) Static RAM requires refreshing

66. The binary of the decimal number 219 is
(a) $(11011011)_2$ (b) $(10101010)_2$
(c) $(11110000)_2$ (d) $(11001100)_2$

67. The Octal equivalent of the Hexadecimal number $(A07)_{16}$ is
(a) $(7005)_8$ (b) $(1007)_8$
(c) $(5007)_8$ (d) $(4055)_8$

68. If $(2?5)_8 = 141$, then the missing digit is
(a) 1 (b) 2
(c) 3 (d) 4

69. Which of the following is a high - level programming language?
(a) Machine Language
(b) Assembly Language
(c) Both (a) and (b)
(d) COBOL

70. If $(123)_b = 291$, then the value of the base ' b ' is?
(a) 4 (b) 8
(c) 10 (d) 16

71. If ' 120456 ' is to ' 315′ ', then ' 204562 ' is to
(a) 816 (b) 2134
(c) 613 (d) 415

72. $263:36::139:?$
(a) 36 (b) 27
(c) 63 (d) 72

73. MNPQ : QTRU : : FIGP :
(a) JMTK (b) JMKU
(c) JMKT (d) MKUJ

74. Three of the following four are alike in a certain way and so form a group. Which is the one that does not belong to that group?
(a) 185 (b) 165
(c) 65 (d) 85

75. Three of the following four are alike in a certain way and so form a group. Choose the odd one out?
(a) 3,7,11,13 (b) 6,8,15,18
(c) 2,7,19,23 (d) 3,5,7,17

76. Which of the following is a wrong number in the series:
$78, 57, 36, 19, 10, 2, ?$
(a) 2 (b) 10
(d) 36 (d) None

77. What will be the next number in the following series?
$2, 6, 42, 1806,$
(a) 20005 (b) 251645
(c) 3263442 (d) None of these

78. A letter series is given in which some letters are missing. The missing letters are given in the proper sequence as one of the options. Find the correct options.
C__BBA__CAB__AC__AB__AC
(a) BABCC (b) ACBCB
(c) ABCBC (d) BCACB

79. One terms in the following number series is wrong. Find out the wrong term.
$1, 2, 6, 15, 30, 56$
(a) 6 (b) 15 (c) 30 (d) 56

80. If ' $234'$ is to ' $10'$ ', then ' $345'$ is to
(a) 13 (b) 11 (c) 12 (d) 10

81. Find odd one out
(a) C (b) I
(c) S (d) T

82. If HOTEL = 55, then BORE = ?
(a) 40 (b) 45
(c) 35 (d) 55

83. In a certain code 13479 is written as AQFJL and 5268 is written as DMPN. How is 396824 written in that code?
(a) QLPMNF (b) QLPNKJ
(c) QLPNDF (d) QLPNMF

84. If $54 + 43 = 2, 60 + 51 = 10$, then $62 + 72 = ?$
(a) 9 (b) 10
(c) 18 (d) 27

85. A and B are brothers. C and D are sisters. A's son is D's brother. How is B related to C?
(a) Father (b) Brother
(c) Uncle (d) Grandfather

86. Introducing Sanjay, Rinki said, "His brother's father is the only son of my grandfather". How is Rinki related to Sanjay?
(a) Sister (b) Mother
(c) Niece (d) Daughter

87. A is the brother of B, B is the brother of C. D is the father of A. Which of the following statements cannot be definitely true?
(a) B is the brother of A
(b) B is the son of D
(c) A is the brother of C
(d) C is the brother of A

88. '$X + Y'$ means ' Y is the brother of X' '$X \times Y'$ means ' Y is the husband of X'; '$X - Y'$ means ' X is the mother of Y'; $\frac{'X}{Y'}$ means ' X is the father of Y'. Then which of the following expression indicates P is grandmother of T.
(a) $Q - P + \frac{R}{T}$ (b) $P \times \frac{Q}{R} + T$
(c) $P \times Q/R - T$ (d) None of these

89. A, B, C, D and E when arranged in descending order of their weights from the top, A becomes third, E is between D and A while C and D are not at the top. Who among them is the second heaviest?
(a) A (b) B
(c) C (d) E

90. Q, R, S, T, U and V are seated in a straight line facing North. S is second to the right of T and T is second to the right of Q · R is to the left of Q and second to the left of V. What is Q's position with respect to S ?
(a) Third to left (b) Fourth to left
(c) Second to left (d) Fifth to left

91. Which of the following is not a synonym of "sympathy"?
(a) Pity (b) Consolation
(c) Hostility (d) Commiseration

92. Which of the following is the antonym of "patience"?
(a) Forbearance (b) Stoicism
(c) Sufferance (d) None of these

93. Which of the following words is correctly spelled?
(a) Liaison (b) Liasion
(c) Liason (d) None of these

94. The past participle of the verb "become" is
(a) Became (b) Becomed
(c) Become (d) None of these

95. The simple past of the verb "set" is
(a) Sit (b) Set
(c) Sat (d) None

96. What year did you university?
(a) Graduate (b) Graduating
(c) Graduate from (d) Graduating from

97. I have trouble _____
(a) Remembering my password
(b) Remember my password
(c) To remember my password
(d) To remembering my password

98. _____ Albert Einstein became famous mainly for his work on relativity; he received the Nobel Prize for his work on photoelectric law.
(a) Because (b) As long as
(c) Ever since (d) Despite the fact that

99. There are many interesting events in the night - time sky.
(a) Being observed (b) Having observed
(c) That observed (d) Which are observing

100. We must be grateful for the blessing that God has on us.
(a) Bestowed (b) Given
(c) Granted (d) Presented

ANSWER KEY

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
d	d	b	c	b	a	b	c	d	a
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
b	d	a	c	d	c	d	c	d	c, d
21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
a	c	b	d	a	b	a	b	c, d	b
31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
b	a	c	b	d	a	c	b	c	a
41.	42.	43.	44.	45.	46.	47.	48.	49.	50.
a	b	c	d	b	b	d	c	a	c
51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
c	d	b	a	a	d	c	c	d	c
61.	62.	63.	64.	65.	66.	67.	68.	69.	70.
c	c	c	d	d	a	c	a	d	d
71.	72.	73.	74.	75.	76.	77.	78.	79.	80.
c	b	c	b	b	a	c	b	c	a
81.	82.	83.	84.	85.	86.	87.	88.	89.	90.
b	c	d	a	c	a	d	c	c	b
91.	92.	93.	94.	95.	96.	97.	98.	99.	100.
c	d	a	c	b	c	a	d	a	a

SOLUTION

1. $\lim_{x\to\frac{\pi}{4}} \frac{sinx-cosx}{x-\frac{\pi}{4}}$
L's Hospital –
$\lim_{x\to\frac{\pi}{4}} \frac{\cos x-sinx}{1}$
$cos\frac{\pi}{4}+sin\frac{\pi}{4}$
$\frac{1}{\sqrt{2}}+\frac{1}{2}=\frac{2}{\sqrt{2}}$
$=\sqrt{2}$

2. $\lim_{n\to0} \frac{\sqrt{x+n}-\sqrt{x}}{n}$
$\lim_{n\to0} \frac{1}{2\sqrt{x+n}}-\frac{1}{2\sqrt{x}}$
$\lim_{n\to0} \frac{1}{\frac{2\sqrt{x+n}}{1}}-0$
$\frac{1}{2\sqrt{x}}$ Ans.

3. $\lim_{n\to0} \frac{a^x-x^a}{x^n-a^a}-1$
$\lim_{n\to0} \frac{a^x loga-ax^{a-1}}{x^x(\log x+1)-0}-1$
Put, limit
$\frac{a^x loga-ax^{a-1}}{a^a(\log a+1)}=-1$
$=\frac{a^a loga-a^a}{a^a(loga+1)}=-1$
$=\frac{\log a-1}{loga+1}=-1$
log a -1 = –log a –1
2 log a = 0
Log, a = 0
$a = e^0$
a = 1 Ans.

4. $\lim_{x\to0} \frac{x^{10}-a^{10}}{x^2-a^2}$
L's Hospital Ruler
$\lim_{x\to a} \frac{10x^9}{2x}$
$\frac{10a^9}{2a}$
$= 5a^8$ Ans.

5. $\lim_{x\to n} \frac{x+x^2+\cdots\ldots x^{10}-10}{5x-5}$
$\lim_{x\to1} \frac{1+2x+\cdots.10x^9-0}{5}$
Put limit
$\frac{1+2+\cdots\ldots10}{5}$
$\frac{10(11)}{2\times5}$ = 11 Ans.

6. $\int \frac{1+\log x}{x}\,dx$
Let 1 + log x = 7
$\frac{1}{x}dx=dt$
$=\int t\ dt$
$=\frac{t^a}{2}$
$=\frac{1}{2}(1+\log, x)^2$

7. $\int |x|^3\,dx,$ x>0
$|x| = \begin{cases} x, & x>0 \\ -x, & x<0 \end{cases}$
$\int x^3\,dx$
$\frac{x^4}{4}+C$ Ans.

8. $\int_0^{\pi/4} \sec^2 x \sin x\,dx = a+\sqrt{2}$
$\int_0^{\pi/4} \sec x \tan x\,dx$
$[secx]_0^{\pi/4}$
Sec $\frac{\pi}{4}$ – sec 0
$\sqrt{2}-1 = a+\sqrt{2}$
a = –1

9. $\int_0^1 \frac{x}{(1-x)^{\frac{1}{2}}}$
$\sqrt{1-x}$ = t

$1 - x = t^2$
$x = 1 - t^2$
$dx = -2t\,dt$
$\int_0^1 \frac{(1-t^2)}{t}(-2)\,dt$
$-2\int_0^1 (1-t^2)dt$
$-2\left[t - \frac{t^3}{3}\right]_0^1$
$= -2\left[0 - \frac{0}{3} + \left(1 - \frac{1}{3}\right)\right]$
$= -2 \times \frac{2}{3} = \frac{-4}{3}$ Ans.

10. $\int \sqrt{x}\, e^{\sqrt{x}} dx$
Put $x = t^2$
$dx = 2tdt$
I.....$2\int t^2 e^t dt$
$= 2\int t^2 e^t - \int 2t\, t^+ dt]$
$= 2[t^2 e^t - 2(te^t - \int e^t dt\,]$
$= 2t^2 e^t - 4te^t + 4e^+$
$= 2x\, e^{\sqrt{x}} - 4\sqrt{x}\, e^{\sqrt{x}} + 4e^{\sqrt{x}} + c$

11. $2\sin^2\theta.\cos^2\theta\,(\sec^2\theta + \text{cosec}\,\theta)$
$2\sin^2\theta\cos^2\theta\sec^2\theta + 2\sin^2\theta$
$\text{Cos}\,5^2\,\theta\,\text{coec P}\theta$
$2(\sin^2\theta + \cos^2\theta)$
$= 2$ Ans.

12. $\cos\theta + \sec\theta = 3$
$\text{Cos}^2\theta + \sec^2\theta$?
$(\cos\theta + \sec\theta)^2 = 9$
$\text{Cosec}^2\theta + \sec^2\theta + 2 = 9$
$\text{Cos}2\theta + \sec^2\theta = 7$

13. $\tan 1^0, \tan 2^0. \tan 3^0$.....$\tan 89^0$
$(\tan 1^0, \tan 2^0$.....$\tan 44^0)\tan 45^0$
$(\tan(90^0 - 44)\tan(90 - 43^0)$
.....$\tan(90^0 - 09')$
$(\tan 1'' \tan^{2*}$..... $\tan 44^0)$
$\text{Tan}\,45^0\,9\cot 44^0)$
$\text{Tan}\,45^0\,(\cot 44^0.\cot 43^0$ ..... $\cot 1^0)$
$= 1$

14. $\cos\theta + \cos^3\theta = \sin^2\theta$
$\sin^6\theta - 4\sin^4\theta + 8\sin^2\theta$
Solution:
$\cos\theta + \cos^3\theta = \sin^2\theta$
$\cos\theta(1 + \cos^2\theta) = \sin^2\theta$
$\cos\theta(1 + \cos^2\theta) = 1 - \cot^2\theta$
$\cos\theta(2 - \sin^2\theta) = \sin^2\theta$
$\cos^2\theta(2 - \sin^2\theta)^2 = \sin^4\theta$
$(1 - \sin^2\theta)(4 + \sin^4\theta - 4\sin^2\theta) = \sin^4\theta$
$4 + \sin^4\theta - 4\sin^2\theta - 4\sin^2\theta - \sin^6\theta + 4\sin^4\theta\ \ \sin^4\theta$
$4 + 5\sin^4\theta - 8\sin^2\theta - \sin^6\theta = \sin^4\theta$
$4 + 4\sin^4\theta - 8\sin^2\theta - \sin^6\theta = 0$
$4\sin^4\theta - 8\sin^2\theta - \sin^6\theta = -4$
$\sin^6\theta - 4\sin^4\theta + 8\sin^2\theta = 4$ Ans.

15. $\cos^2\theta + \sec^2\theta = a$
$(\cos\theta - \sec\theta)^2 + 2\cos\theta\sec\theta$
$(\cos\theta - \sec\theta)^2 + 2 \geq 2$
AM $\geq$ GM
$\frac{cosec^2\theta + \sec^2\theta}{2} \geq \sqrt{cos^2\theta}$
$\text{cosec}^2\theta + \sec^2\theta \geq 2$
$a \geq 2$

16. Amplitude of $\frac{1+i\sqrt{3}}{\sqrt{3}+i}$
Let $z = \frac{1+i\sqrt{3}}{\sqrt{3}+i^2}$
$z = (1+i\sqrt{3})(\sqrt{3} - i)$
$(\sqrt{3} + i)(\sqrt{3} - i)$
$\frac{\sqrt{3}+3i-i-\sqrt{3}}{4}$
$\frac{-i^2\sqrt{3}+2i+\sqrt{3}}{4}$
$= \frac{2\sqrt{3}+2i}{4}$
$= \frac{2i}{4} + \frac{2\sqrt{3}}{4}$
$= \frac{1\ i}{2} + \frac{\sqrt{3}}{2}$
$tan\,\alpha = \left|\frac{Im(z)}{Re(z)}\right| =$
$\alpha = \frac{\pi}{6}$ Z lies in 1st quadrant

17. $z^2 + 2\bar{z} = 0$
Let $z = x + iy$
$Z^2 = x^2 - i^2 + 2i\,xy$
$Z^2 + 2\bar{z}$
$(x^2 - y^2 + 2ixy) + 2(x - iy)$
$= 2xy - y = 0$
$y(2x - 1) = 0$
$y = 0$
$x = ½$
$x^2 - y^2 + 2x = 0$
$y = 0, x^2 + 2x = 0$
$x(x + 2) = 0$
$x = 0$
$x = -2$
$x^2 - y^2 + 2x = 0$
$x = ½$
$\frac{1}{4} = y^2 + \frac{2}{8} = 0$

$Y^2 = 5/4$
$Y = \pm\frac{\sqrt{5}}{2}$
(1/2, 0)
(1/2=(0,0) (-2,0)
$\left[\pm\frac{\sqrt{3}}{2}, \frac{1}{2}\right]$
4 Solutions. Ans.

18. Z. be a complex number
$Z^2 + |z|^2 = 0$
$Z = 1 - 4i$
$|Z|^2 = (3 - 4i)(3 - 4i)$
$|Z|^2 = |-24i - 5|$
$|Z|^2 = 24i + 5$
$Z^2 = -24i - 5$
$z^2 + |z|^2 = 0$
Option (d) is correct.

19. Solution
If w is the complex
cube root of unity then
$w^3 = 1$
$1 + w + w^2 - 0$
$1 + w = -w^2$
$1 + w + w^2 = 0$
$1 + w^2 = -w$
Therefore,
$(1 + w - w^2)(1 - w + w^2) = (-w_2+1)(-w^2)(-w-w)$
$= (-2\ w^2)(-2w)$
$= 4w^3$
$= 4$ Ans. [$\because w^3-1$]
Correct option is (d)

20. cube root of unity are 1, w, w^2
$1 + w + w^2 = 1$
$(x-1)^3 + 8 = 0$
$(x-1)^3 = = -8$
Also 1, w, w^2 are the cube roots of unity
$(x-1) = -2(1)^{1/3}$
$x = -2$
$x = -2w^2$
$x = 1-2\ w$
$x = -1, 1-2w^2, 1-2\ w$

21. $Tm = n$
$Tn = m$
$a + (m-1)\ d = n$ .....(1)
$a + (n-1)\ d = m$ .....(2)
$d\ (m-1-n+1) = n - m$
$d\ (m-n) = n - m$
$d = -1$
$a + (m-1)(-1) = n$
$a - m + 1 = n$
$a = n + m - 1$
$T_{10} = a + ad$
$= n + m - 1 - q$
$T_{10} = n + m - 10$

22. $S_n = 3n^2 + 5$
$T_n = 159$
$S_{n-1} = 3n^2 + 5$
$T_n = 159$
$S_{n-1} = 3\ (n-1)^2 + 5$
$\because T_n = S_n - S_{n-1}$
$159 = 3x^2 + 5 - 3\ (n-1)^2 \div 5$
$159 = 3x^2 - 3\ (n^2 + 1 - 2n)$
$159 = 3x^2 - 3x^2 - 3 + 6\ x$
$159 = -3 + 6n$
$162 = 6\ n$
$N = 27$ Ans.

23. $x^3 - 9x^2 + 23\ x - 15 = 0$
$X = a$
$B = a + d$
$r = a - d$
$a + a + d + a - d = 9$
$3a = 9$
$a = 3$
$9\ (a + d)\ (a - d) = 15$
$3\ (3 + d)\ (3 - d) = 15$
$3\ (9 - d^2) = 15$
$9 - d^2 = 5$
$d^2 = 4$
$d = \pm 2$

24. $\log_2 (5.2^x + 1), \log_4 (2^{1-x} + 1), h$
$2 \log_4 (2^{1-x} + 1) = \log_2 (5.2^x + 1) + 1$
$\log_2 (2^{1-x} + 1) = \log_2 (5.2^x + 1) + \log_2^2$
$\log_2 (2^{1-x} + 1) = \log_2 (2.5.\ 2^x + 3)$
$2^{1-x} + 1 = 10 \times 2^x + 2$
$2^{1-x} = 10 \times 2^x + 1$

$\frac{2^1}{2^x} = 10 \times 2^x + 1$
$2 = 10 \times 2^{2x} + 2^x$
$2^x = t$
$2 = 10\ t^2 + t$
$10t^2 + t - 2 = 0$
$(2t + 1)(5t - 2) = 0$
$t = \frac{-1}{2} \quad \Rightarrow 2^x = \frac{-1}{2}$
$7 = 2/5 \quad \Rightarrow 2^x = 2/5$
$x = \log_2 (2/5)$
$x = 1 - \log_2 5$

25. $Sn = 3x^2 + 4x$
$S_{n-1} = 3\ (n-1)^2 + 4\ (n-1)$
$T_n = S_n - S_{n-1}$
$= 3x^2 + 4x\ 73\ (n-1)^2 - 4(n-1)$
$= 3x^2\ 4\ x - 3\ (n^2 + 1 - 2n) - 4(n-1)$
$= 3x^2 + 4x - 3x^2 - 3 + 6n - 4x + 4$
$= 6n + 1$
$T_1 = 7$
$T_2 = 13$
For n = 1,2,3,4,...
T_n = 7, 13, 19 ..... In A.P.

26. ${}^8C_r - {}^7C_3 = {}^7C_2$
${}^8C_r = {}^7C_2 + {}^7C_3$
${}^8C_r = {}^8C_3 \quad {}^8C_3 = {}^8C_5$
$r = 3 \Rightarrow r = 5$

27. BANANA
2 N's come together
NN B A A A
$\frac{5!}{3!} = 5 \times 4$
$= 20$

BANANA
$\frac{6!}{2!3!} = 60$
$60 - 20 = 40$ ans.

28. $\underline{2}\ \underline{3}\ \_\ \_\ \_ = 6$
3 x 2 Y 1

__3__ __ __ __ __ = 24
3 x 3 x 2 x 1
__4__ 4 x 3 x 2 Y 1 = 24
__5__ __ __ __ = 24
4 x 3 x 2 x – 1
2 4 __ __ __ = .6
3 x 2 x 1
25 __ __ __ = 6
3 x 2 x 1
6 +24 + 24 + 24 + 6 + 6
= 90
90 Ans.

29. $x^8 y^{10}$ coefficient
$(x + y)^{18}$
$T_{r+1} = {}^{18}C_r x^r y^{18-r}$
r = 18
$T_q = {}^{18}C_r x^8 y^{10}$
${}^{18}C_8$ Ans.

30. So coefficient of x^4
$= (1 + x + x^{-2} + x^3)^{11}$
$= (1 + x^2)^{11} (1 + x)^{11}$
$= (1 + 11 x^2 + {}^{11}C_2)^{11}$
$= (1 + 11x^2 + {}^{11}C_2 x^4 + \ldots x^{22})$
$(1 + 11x + {}^{11}C_2 x^2 + \ldots\ldots x^n)$
Coefficient of x^4
$= 1 \times {}^{11}C_4 + 11 \times {}^{11}C_2 + {}^{11}C_2 \times 1$
$= {}^{11}C_4 + 12x\ {}^{11}C_2$
= 330 + 660
= 990 ans.

31. A be a set of cardinality of n, the number of one two one onto function from set A + A.
= n!

32. n(a) = 10
n (B) = 5
$= 5^{10}$

33. $(A \cup B)' \cap B$
$(A' \cap B') \cap B$
$(A \cap B) \cap (B' \cap B)$
$(A' \cap B)$
= B

34. A = {a, b, c}
B = {a, b, d, e, f}
(A–B) x (A ∩B)
(e) x (a, b)
= 2 Ans.

35. n(A) = 3
n (B) = 5
A x (B–A)
= 3 x (5–3)
6
Then power set of A x (B – A) contains
$P(A \times (B-A)) = 2^6$

36. $y = \tan^{-1}\left[\frac{1+\tan x}{1-\tan x}\right]$
$y = \tan^{-1}\left[\frac{\tan^{\pi/4}+\tan x}{1-\tan x \tan\frac{\pi}{4}}\right]$
$4 = \tan^{-1}\left\{\tan\left(\frac{\pi}{4}+x\right)\right\}$
$y = \frac{\pi}{4} + x$
$\frac{dy}{dx} = 1$

37. y = log (tan θ)
$\frac{dy}{d\theta} = \frac{1}{\tan\theta} \sec^2\theta$
$\frac{dy}{d\theta} = \frac{\cos\theta\ \sec^2\theta}{\sin\theta}$
$= \frac{\sec\theta}{\sin\theta}$
$\frac{dy}{d\theta}$ = cosec θ sec θ Ans.

38. $\sqrt{x+y} + \sqrt{y-x} = a$ .....(1)
$\left(\frac{\sqrt{x+y}+\sqrt{y-x}}{\sqrt{x+y}-\sqrt{y-x}}\right)\left(\sqrt{x+y} - \sqrt{y+x}\right) = a$
$= \frac{x+y+y+x}{\sqrt{x+y}-\sqrt{y-x}} = a$
$= \frac{2x}{\sqrt{x+y}-\sqrt{y-x}} = a$
$= \frac{2x}{a} = \sqrt{x+y} - \sqrt{y-x}$ .....(2)
1 + 2
$2\sqrt{x+y} = a + \frac{2x}{a}$
$4x + 4y = a^2 + \frac{4\times2}{a^2} + 4x$
$4y = \frac{a^2+4x^2}{a^2}$
$y\frac{dy}{dx} = 0 + \frac{8x}{a^2} + 24$
$\frac{dy}{dx} = \frac{8x}{d^2\times4}$
$\frac{dy}{dx} = \frac{2x}{a^2}$
$\frac{d^2y}{dx^2} = \frac{1}{a^2}.2$
$= \frac{2}{d^2}$ Ans.

39. $y = x + e^x$
$\frac{dx}{dy} = 1 + e^x$
$\frac{dx}{dy} = \frac{1}{1+e^x}$ Ans.

40. $y = (x^x)^x$
$\log_4 = x^2 \log x$
$\frac{1}{y}\frac{dy}{dx} = x^2\frac{1}{x} + logx, 2x$
$\frac{1}{y}\frac{dy}{dx} = x + 2x \log x$
=y [x (1+ 2 log x)]
$\frac{dy}{dx}$ = xy + 2xy logx

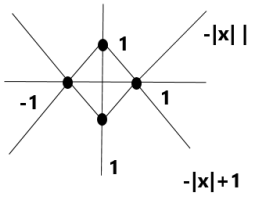
41. A (12, 8)
B (–2, 6)
C (6, 0)
$AB = \sqrt{196+4}$
$\sqrt{200}$
$BC = \sqrt{(6+2)^2 + (0-6)^2}$

$\sqrt{100}$
AC = $\sqrt{(6-62)^2+(0-\theta)^2}$
= $\sqrt{36+64}$
= 100
$(AB)^2 = (AC)^2 + (BC)^2$
Right angle A.

42. P (x, y) equidistant
From the point
A (a+b, b –a)
B (a – b, a + b)
PA = $\sqrt{(a+b-x)^2+(b-a-y)^2}$
PB = $\sqrt{(a-b-x)^2+(b-a-y)^2}$
PA = PB
Square both sies
$(a + b – x)^2 + (b – a – y)^2 = (a – b -x)^2 + (a + b – y)^2$
$a^2 + b^2 + x^2 + 2ab – 2bx – 2x\ a + b^2 + a^2 + y^2 – 2ab$
$+ 2ay – 2by = a^2 + b^2 + x^2 – 2ab + 2bx – 2\ ax$
$+ a^2 + b^2 + y^2 + 2ab – 2by – 2ya$
$-2\ bx + 2ay = 2bx – 2ay$
$2\ bx = 2ay$
bx = ay Ans.

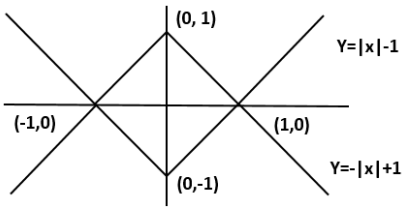
43. 2x + 6y + 7 = 0
Slope = $-\frac{2}{6} = \frac{-1}{3}$
Slope intercept
$y = \frac{-1}{3}x + b$
x (3b, 0)
y (0, b)

Distance = 10
$(10)^2 = (3b)^2 + b^2$
$100 = 9b^2\ b^2$
$10b^2 = = 100$
$b^2 = 10$
$n = \pm\sqrt{10}$
$y = \frac{-1}{3}x\ \pm\sqrt{10}$
2 Eq. line Ans. 2



= 4x $\int_{-1}^{0} x + 1$
4x $\left[\frac{x^2}{2} + x\right]_{-1}^{0}$
4x $\left[\frac{-1}{2} + 1\right]$
4x $\left[\frac{1}{2}\right]$
$\frac{4}{2}$ = 2 Units

44. (d)
45.



$\int_1^0 |x| - 1 + \int_0^1 -|x| + 1$
$\left[\frac{x^2}{2} - x\right]_{-1}^{0} + \left[\frac{-x^2}{2} + x\right]_0^1$
$\left[0 - \frac{1}{2} - 1\right] + \left[-\frac{1}{2} + 1 - 0\right]$
$\frac{1}{2} + \frac{1}{2}$
= 1 square unit

46. $\vec{a} = i + j$
$\vec{b}$ = k + j
$\hat{n} = \pm\left(\frac{a \times b}{|a \times b|}\right)$
a x b = $\begin{vmatrix} i & j & k \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{vmatrix}$
a x b = i – j + k
|a x b| = $\sqrt{3}$
$\Rightarrow \hat{n} = \pm\left(\frac{i-j+k}{\sqrt{2}}\right)$
Number of two vectors. Ans.

47. angle between
a x b and b x a
a x b and –(a x b)
magnitude same direction opposite angle
180^0 Ans.

48. Sum of two dice will
Be = 7
(1, 6) (2, 5), (3, 4) (4, 3)
(5, 2) (6, 1) = 6
Total 36
= $\frac{6}{36} = \frac{1}{6}$

49. JAMIA
= $\frac{{}^3C_1}{5C_i} = \frac{3}{5}$ Ans.

50. Total ways = 6 x 2 = 12
Favourable ways = 1
= $\frac{1}{12}$ Ans.

51. 2's complement of Binary number
$(10101000)_2$
$10101000 \xrightarrow{2's} 1011000$
= $(01011000)_2$ Ans.

52. option (c) both (a) and (b)
53. 8085 is a 8 bit microprocessor
8 Ans.
54. IOS
55. Program counter
56. LPeta byte = 1024 TB

57. In IP address 125, 250, 250. 250 first octet is 125 which lies in range 1–125 of classes.
58. 255,000
59. Class D
60. $\frac{n(n-1)}{2}$
61. BIOS
62. Cache memory
63. EEPROM
64. Charles Babbage
65. option (C)

66. Binary of decimal number 219

2	219	1	(11011011)
2	109	1	
2	54	0	
2	27	1	
2	13	1	
2	6	3	
2	6	3	
2	3	1	
	1		

67. $(A07)_{16}$ - ( )$_8$
A 0 7
(6^2 $6!^1$ 16^0)
2.560 + 0 + 7
= $(2567)_{10}$

8	2567	7	= $(5007)_8$ Ans.
8	320	0	
8	40	0	
	9		

68. $(2 \quad ? \quad 5)_8 = (141)_{10}$

8	14	5
8	17	1
	2	

$(215)_8 = \Rightarrow$ 1 Ans.

69. (d)
70. $(123)_6 = 291$
$1 \times b^2 + 2b^1 + 3 \times b^0 = 291$
$b^2 + 2^b + 3 - 291 = 0$
$b^2 + 2b - 288 = 0$
$(b - 16)(b + 18) = 0$
$b = 16, -18$
$b = 16$ Ans.

71. 1 2 0 4 5 6
315
1 + 2 + 0 = 3
4 + 5 + 6 = 15
= 315
2 0 4 5 6 2
2 + 0 + 4 = 6
5 + 6 + 2 = 13
613 Ans.

72. 263 : 36 :: 139 : ?
2 x 6 x 3 = 36
1 x 3 x 9 = 27
= 27 Ans.

73. MNPQ : QTRU ::
FIGP : ?
JMKT

74. 185 = 37 x 5
165 – 33 x 5
65 = 13 x 5
85 = 17 x 5
165 Ans.

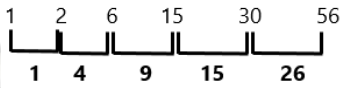
75. (b)

76. 78, 57, 36, 19, 10, 2, 9
2 Ans.

77. 2, 6, 42, 1806, ?
1 x 2, 2 x 3, 6 x 7 .....42 x 43
1806 x 1807
3 26 3442 Ans.

78. C__BBA_CAB _ AC _ AB _AC
ACBCB Ans.

79. 1, 2, 6, 15, 30, 56



$1 = 1^2$
$4 = 2^2$
$9 = 3^2$
$16 = 4^2$
30 is wrong number.

80. 234 →'10'
2 + 3 + 4 → 10
2 + 4 + 5 → 13
345 → 13 Ans.

81. (b) I

82. HOTEL = 55
BORE
2 + 15 + 18 + 5 = 40
40 – 4 = 36 Ans.

83. 1 3 4 7 9
A Q F J L
5 2 6 8
D M P N
3 9 6 8 2 4
Q L P N M F Ans.

84. 54 + 43 = 2
60 + 51 = 10
62 + 72 = 9

85. $A^+ = B^+$

C^- = D^-
A+
|
+ = D^-
Uncle
B related to C
Uncle

86. Sister
D+

87. $A^+ = B^+ = C$
C is the brother of A

89. (c)

90. R Q V I U S

ANSWER KEY							
91.	(c)	92.	(d)	93.	(a)	94.	(c)
95.	(b)	96.	(c)	97.	(a)	98.	(d)
99.	(a)	100.	(a)				