JNU MCA - 2003

1. The fourth power of $\sqrt{1+\sqrt{1+\sqrt{1+}}}$ is

(a) $3+2\sqrt{2}$ (b) $1+2\sqrt{3}$ (c) $(1/2)(7+3\sqrt{5})$ (d) $\sqrt{2}+\sqrt{3}$

2. The last digit of 2^{199} is

(a) 2 (b) 4 (c) 6 (d) 8

3. If $1!+2!+3!+\ldots+95! = x \bmod 15$, then one possible value of x is

(a) 14 (b) 3 (c) 1 (d) None of these

4. If $|z-4z^{-1}|=2$, then the greatest of value of $|z|$ is

(a) $\sqrt{2}$ (b) $\sqrt{3}$ (c) $\sqrt{5}$ (d) $\sqrt{5}+1$

5. A simple graph with n vertices must be connected if it has more than

(a) $(n-1)/2$ edges (b) $n^3/2$ edges

(c) $\dfrac{|(n-1)(n-2)|}{2}$ edges (d) n edges

6. Twenty-five members of a new club meet each day for lunch at a round able. They decide to sit such that every member has different neighbours at each lunch. How many days can this arrangement last ?

(a) 25 days (b) 12 days (c) 18 days (d) 13 days

7. The maximum level, $l_{\max}$, of any vertex in a binary tree is called the height of the tree. The minimum possible height of an n-vertex binary tree is

(a) $\log_2 n$ (b) $n-1$ (c) $[\log_2 (n+1)-1]$ (d) $[\log_2 n]$

8. The value of $\int_2^3 \dfrac{(x+1)\,dx}{\sqrt{x^2+2x+3}}$ is

(a) $\sqrt{18}$ (b) $\sqrt{18}-\sqrt{11}$ (c) 7 (d) None of these

9. If m and n are positive numbers then the limit $\lim_{x\to 0} \dfrac{m^x - n^x}{x}$ is equal to

(a) $\log \dfrac{m}{n}$ (b) $m-n$ (c) $\dfrac{m}{n}$ (d) Does not exist

10. The rate at which body changes temperature is proportional to the difference between its temperature and that of the surrounding medium. This is called Newton's law of cooling. If $y=f(t)$ is the unknown temperature of the body at time t and $M(t)$ denotes the known temperature of the surrounding medium, Newtion's law leads to the differential equation

(a) $y' = ky$ (b) $y' = -k[y-M(t)]$

(c) $y' = -ky$ (d) $y' = -k\,M(t)$

where k is a positive constant.

11. The series $\sum_{n=1}^{\infty} \frac{1}{(2n-1)(2n+1)}$ converges and has the sum

(a) $\frac{1}{2}$ (b) $\frac{3}{4}$ (c) $\frac{3}{2}$ (d) $\frac{1}{4}$

12. If $z = (\lambda + 3) + i\sqrt{5 - \lambda^2}$ (λ is a real parameter and $i = \sqrt{-1}$), then the locus of z is

(a) circle (b) ellipse (c) parabola (d) hyperbola

13. If $x = \sqrt{2 + \sqrt{2 + \sqrt{2 + \ldots \text{up to } \infty}}}$, then x equals

(a) -1 (b) ln 2 (c) 2 (d) 2 ln 2

14. If S_r $(1 \le r \le 9)$ denotes the sum to r terms of the series $1 + 22 + 333 + 4444 + \ldots + \underbrace{99\ldots\ldots9}_{9 \text{ times}}$, then $9(S_n - S_{n-1})$ for $2 \le n \le 9$ equals

(a) $10^n - n^2 + n$ (b) $10^n - n^2$ (c) $10^n - 1$ (d) $n(10^n - 1)$

15. $\lim_{x \to \infty} [\sqrt{x+1} - \sqrt{x-1}] =$

(a) 1 (b) $\sqrt{2}$ (c) ∞ (d) 0

16. Let A_r denote the number of ways of selecting r objects from n objects with unlimited repetitions. Then A_r equals

(a) $\binom{n}{r}$ (b) $\binom{n+r-1}{r}$ (c) n^r (d) r^n

17. A car travels from P to Q at 30 kmph and returns from Q to P at 40 kmph by the same route. Its average speed, in kmph, is nearest to

(a) 32 (b) 33 (c) 34 (d) 35

18. The remainder when 3^{37} divided by 79 is

(a) 1 (b) 2 (c) 13 (d) 35

19. The number of terms in the expansion of $[(x+3y)^2 (x-3y)^2]^2$ is

(a) 4 (b) 5 (c) 6 (d) 7

20. If x, y, z and w satisfy the equations $x + 7y + 3z + 5w = 0$

$$8x + 4y + 6z + 2w = -16$$
$$2x + 6y + 4z + 8w = 16$$
$$5x + 3y + 7z + w = -16$$

then $(x + w)(y + z)$ equal

(a) 4 (b) 0 (c) 16 (d) -16

21. An investor has twenty thousand dollars to invest among 4 possible investments. Each investment must be in units of a thousand dollars. If the total is to be invested, how many different investment strategies are possible ?

(a) $\binom{23}{3}$ (b) $\binom{23}{4}$ (c) $\binom{24}{3}$ (d) $\binom{24}{4}$

22. An ordinary deck of 52 playing cards is randomly divided into 4 piles of 13 cards each. The probability that each pile has exactly 1 ace is

(a) 0.105 (b) 0.215 (c) 0.516 (d) 0.001

23. An infinite sequence of independent trials is to be performed. Each trial results in success with probability p and a failure with probability $1 - p$. What is the probability that at least one success occurs in the first n trials ?

(a) $p(1-p)^{n-1}$ (b) $(1-p)^n$ (c) $1-(1-p)^n$ (d) p^n

24. Suppose that the number of typographical errors on a single page of a certain book has Poisson distribution with parameter $\lambda = 1/2$. In 600 pages book, the average number of errors in the book is

(a) 300 (b) 150 (c) 600 (d) 393

25. In seven-layer OSI network architecture, the fourth layer corresponds to

(a) data link control layer (b) session layer

(c) transport layer (d) presentation layer

26. If in a group G, $a^5 = e$, $aba^{-1} = b^2$ for $a, b \in G$, then $o(b)$ equals

(a) 5 (b) 7 (c) 29 (d) 31

27. What is the remainder when the sum $1^5 + 2^5 + 3^5 + \ldots + 99^5 + 100^5$ is divided by 4?

(a) 0 (b) 1 (c) 2 (d) 3

28. If $g.c.d\,(l, m) = 1$, then $g.c.d.(l^n, m^n)$ for every integer $n \geq 1$ is

(a) $\sqrt{n}$ (b) n (c) n^2 (d) 1

29. The coefficient of x^2 in the trinomial expansion of $(1 + x + x^2)^{10}$ is

(a) $\binom{10}{1}$ (b) $\binom{10}{2}$ (c) $\binom{10}{1} + \binom{10}{2}$ (d) $\binom{10}{3}$

30. Given any five points in the square $1^2 = \{(x, y) : 0 \leq x \leq 1, 0 \leq y \leq 1\}$, only one of the following statements is true. Which one is it ?

(a) The five points lie on a circle

(b) At least one square can be formed using four of the five points

(c) At least three of the five points are collinear

(d) There are at least two points such that the distance between them does not exceed $\frac{1}{\sqrt{2}}$

31. The worst case running time of quick sort is

(a) $O\,(n \log_2 n)$ (b) $O\,(n \log_e n)$

(c) $O\,(n^2)$ (d) None of these

32. The regular expression $(a + b)^* ab\ (a + b)^* b^* a^*$ is equivalent to

(a) $(a + b)^* a (a + b)^* b (a + b)^*$ (b) $(a + b)^* ab (a + b)^*$

(c) $(a + b)^*$ (d) None of these

33. You have an application in which a large but fixed table is to be searched very frequently. The available RAM is adequate to load the table. What would be the best option for storing such a table ?

(a) a sorted array (b) Binary search tree

(c) Hash table (d) A heap

34. The number of ways in which three distinct numbers in AP can be selected from 1, 2, ..., 24 is

(a) 112 (b) 132 (c) 276 (d) 572

35. If $(\log_5 x) \log_x 3x) \log_{3x} y) = \log_x x^3$, then y equals

(a) 25 (b) 125 (c) 5/3 (d) 243

36. The velocity of a car at time t seconds is given by by $3\sqrt{t}$ m/s, the distance travelled by the car in 100 seconds is

(a) 1500 m (b) 2000 m (c) 3000 m (d) 3500 m

37. If $f : R \to R$, $f(x) = 2x + 7$, then $f^{-1}(x)$ is

(a) $7 + 2x$ (b) $2x - 7$ (c) $(x - 7)/2$ (d) Does not exist

38. A natural number a is said to be related to another natural number b if $|a - b| < 4$. The relation is

(a) reflexive and symmetric (b) reflexive and transitive

(c) symmetric and transitive (d) None of these

39. Consider the recurrence relation $x_n = x_{n-2} + (n-2) + (n-1)$ with initial condition $x_1 = 0$. Then x_n equals

(a) $\frac{n(n-1)}{2}$ (b) $\frac{n-1}{2}$ (c) $(n-1)$ (d) $n(n-1)$

40. In a town of 10,000 families, it was found 40% buy newspaper A, 20% buy newspaper B and 10% buy newspaper C. Five percent (5%) of the families buy A and B, 3% buy B and C, 4% buy A and C. If 2% buy all the three newspapers, then the number of families which buy none of the newspapers A, B and C is

(a) 1400 (b) 6000 (c) 3300 (d) 4000

41. There are 20 guests at a party. Two of them do not get along well with each other. In how many ways can they be seated in a row so that these two persons do not sit next to each other ?

(a) 20! (b) 20! – 2 (19)! (c) 19! (d) None of these

42. If X_1 and X_2 are independent normal random variables with parameters (μ, σ_1^2) and (μ_2, σ_2^2), respectively then $X_1 - X_2$ is normal with mean μ and variance σ^2 such that

(a) $\mu = \mu_1 - \mu_2, \sigma^2 = \sigma_1^2 - \sigma_2^2$ (b) $\mu = \mu_1 + \mu_2, \sigma^2 = \sigma_1^2 + \sigma_2^2$

(c) $\mu = \mu_1 + \mu_2, \sigma^2 = \sigma_1^2 \ \sigma_2^2$ (d) $\mu = \mu_1 - \mu_2, \sigma^2 = (\sigma_1 - \sigma_2)^2$

43. Let λ be a constant. Then var $(\lambda, X) = k$ var X, where k equals

(a) 1 (b) λ (c) λ^2 (d) None of these

44. The sum of three positive numbers is unity. The maximum value of their product is

(a) $\frac{1}{8}$ (b) $\frac{1}{16}$ (c) $\frac{1}{27}$ (d) $\frac{1}{64}$

45. The worst case search time using a binary search tree could be

(a) $0(\log_2 n)$ (b) $0(\log_e n)$ (c) $0(n)$ (d) $0(n^2)$

46. You have a primitive machine that can perform only addition and multiplication. It requires the same amount of time for multiplication and addition. Then the minimum number of computations required to evaluate the expression $(ax^4 + bx^3 + cx)$ is

(a) 6 (b) 7 (c) 10 (d) 12

47. An interrupt is

(a) a program that stops the CPU

(b) a response to an asynchronous or exceptional event

(c) a program that is invoked when a printer is out of paper

(d) an operating system module

48. $\begin{vmatrix} 1 & k & k^3 \\ 1 & l & l^3 \\ 1 & m & m^3 \end{vmatrix}$ is

(a) $(k-l)(l-m)(m-k)(k+l+m)$ (b) $k\,l\,m(k+l+m)$

(c) $(k-l)(l-m)(m-k)$(d) $(k^2+l^2+m^2)(k+l+m)$

49. Which of the following is true ?

(a) A macro and a subroutine are the same

(b) A macro is a small subroutine

(c) A macro is a program written in an assembly language

(d) None of the above

50. Define

$A(0, n) = n + 1$ for $n \geq 0$

$A(m, 0) = A(m-1, 1)$ for $m > 0$

$A(m, n) = A(m-1, A(m, n-1))$ for $m > 0$, $n > 0$

Then $A(1, 2) =$

(a) 3 (b) 4 (c) 5 (d) 8

51. The weighted arithmetic mean of the first n natural numbers whose weights are equal to the corresponding numbers is given by

(a) $\frac{2n+1}{3}$ (b) $\frac{2n+3}{6}$ (c) $\frac{n+1}{2}$ (d) $\frac{(n+1)(2n+1)}{6}$

52. Tetrahedron is bounded by

(a) 3 planes (b) 4 planes

(c) 5 planes (d) 6 planes

53. Given $\binom{2n}{2} = 2\binom{n}{2} + S$, the value of S is

(a) n^2 (b) $2n$ (c) $n+2$ (d) $\frac{n(n-1)}{3}$

54. The radius of curvature at the origin for the curve $x^3 + y^3 - 2x^2 + 6y^2 = 0$ is

(a) $\frac{3}{2}$ (b) 2 (c) $\frac{5}{2}$ (d) 3

55. If $A = \begin{bmatrix} 1 & \alpha \\ 0 & 1 \end{bmatrix}$, then A^{10} equals

(a) $\begin{bmatrix} 1 & 10\alpha \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 10\alpha \\ 0 & 10 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & \alpha^{10} \\ 0 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 10^{\alpha} \\ 0 & 10 \end{bmatrix}$

56. For what value of x is $S = |x-0.1| + |x-0.2| + |x-0.3| + |x-0.4| + |x-0.5|$ minimum ?

(a) AM of (0.1, 0.2, 0.3, 0.4, 0.5) (b) HM of (0.1, 0.2, 0.3, 0.4, 0.5)

(c) GM of (0.1, 0.2, 0.3, 0.4, 0.5) (d) Median of (0.1, 0.2, 0.3, 0.4, 0.5)

57. The value of $\sum_{k=0}^{\infty} \frac{(k-1)}{2^k}$ is

(a) – 4 (b) 4 (c) 0 (d) ∞

58. If each element of a $k \times k$ matrix is a Boolean variable,then one can construct M_k number of different matrices, where M_k equals

(a) 2k (b) 2^{k^2} (c) k^2 (d) 2^k

59. Suppose we have two programs, call them P and Q , and that A is the set of all data values acceptable to P and B is the set of all data values acceptable to Q. Then $A \Delta B$ is

(a) the set of all data acceptable to exactly one of the programs P and Q

(b) the set of all data acceptable to both P and Q

(c) the set os all data acceptable to P but not to Q

(d) the set of all data acceptable to Q but not to P

60. Given that $\log_{10} 5 = 0.70$ and $\log_{10} 3 = 0.48$, the value of $\log_{30} 8$ is

(a) 0.61 (b) 0.72 (c) 0.53 (d) 0.86

61. If the roots of $(x-A)(x-B) + (x-B)(x-C) + (x-C)(x-A) = 0$ (where A, B, C are real numbers) are equal, then

(a) $A = B = C$ (b) $A + B + C = 0$ (c) $B^2 - 4AC = 0$ (c) None of these

62. One of the words listed below is my secret word :

AIM, DUE, MOD, OAT,TIE

With this in front of you, if I were to tell you any one of the three letters of my secret word,then you would be able to tell me the number of vowels in my secret word. Which is my secret word?

(a) MOD (b) TIE (c) DUE (d) OAT

63. N bits in binary are approximately equivalent to

(a) $N \log_2 10$ digits in decimal
(b) $N \log_{10} 2$ digits in decimal
(c) $10 \log_2 N$ digits in decimal
(d) $2 \log_{10} N$ digits in decimal

64. Which weekday was May 26, 1949?

(a) Tuesday
(b) Wednesday
(c) Thursday
(d) Friday

65. $\tan^{-1} x + \tan^{-1} y = c$ is the general solution of the differential equation

(a) $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$
(b) $\frac{dy}{dx} = \frac{1+x^2}{1+y^2}$
(c) $(1+x^2)dy + (1+y^2)dx = 0$
(d) $(1-x^2)dx + (1-y^2)dy = 0$

66. The differential equation $y\frac{dy}{dx} + x = c$ represents

(a) a family of circles whose centres are on the x-axis
(b) a family of circles whose centres are on the y-axis
(c) a family of parabola as
(d) a family of ellipses

67. The area bounded by $y = 1 + \frac{8}{x^2}$ and the ordinates $x = 2$ and $x = 4$ is

(a) 2
(b) 4
(c) 2 log 2
(d) log 5

68. If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then $(x + y + z)\left(\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}\right)$ is equal to

(a) 0
(b) 3
(c) u
(d) – 1

69. If $\int_{-1}^{4} f(x)\,dx = 4$ and $\int_{2}^{4} [3 - f(x)]\,dx = 7$, then the value of $\int_{-1}^{2} [f(x)]\,dx$ is

(a) 5
(b) 8
(c) – 1
(d) – 2

70. If $A > B$, then
$V[I] = F[I]$
else
if $B > C$ then
$V[I] = G(I)$
Assume that on the average $A > B$ 75 percent of the time and $B > C$25 percent of the time. If the program segment is executed 10,000 times, would one expect F and G to be executed ?

(a) $F : 2500$, $G : 7500$
(b) $F : 7500$, $G : 625$
(c) $F : 7500$, $G : 1875$
(d) $F : 7500$, $G : 2500$

71. The time required to find an item stored in memory can be reduced considerably if stored date can be identified for access by the content of the data itself rather than by an address. A memory unit accessed by an address is called.

(a) Associative Memory
(b) Cache Memory
(c) Main Memory
(d) Auxiliary Memory

72. Suppose that a computer has 32 K storage locations. Exactly how many storage locations are there ?

(a) 32000
(b) 3768
(c) 32768
(d) 32700

73. In a bivariate distribution, the lines of regression are $3x + 4y = 1$, and $x + y = 0$ then the correlation coefficient r_{xy} is

(a) $\sqrt{\frac{2}{3}}$
(b) $\frac{2}{3}$
(c) $-\frac{2}{3}$
(d) $-\frac{1}{3}$

74. Let X, Y, Z be three independent normal variables $N\ (0, 1)$. Then $E[(X - Y - Z)^2]$ is

(a) 3 (b) 9 (c) 6 (d) 0

75. The variable that has its scope limited to a function and life-time for the entire execution of the program is known as

(a) global variable (b) local variable

(c) static variable (d) extern variable

76. Given the initial value of x being 11, the value of x after executing the expression ($x = x$ and 9)? $x\ [5: x\^5\ ?(x = x \& 6):(x = x | 4)$ will be

(a) 4 (b) 5 (c) 6 (d) 9

77. In C an array consists of 5 elements is the order of index as [10, 34, 18, 24, 30]. A pointer P initially refers to element 34. The value of x after execution of the expression $x = (*P++) + 25$ will be

(a) 60 (b) 59 (c) 33 (d) 27

78. Given the following four statements in C++

(i) Destructor can be virtual

(ii) Constructor can be virtual

(iii) Destructor is not inherited

(iv) Constructor may not be declared constant Identify the correct combination

(a) i, ii, iii (b) i, iii, iv (c) i, ii, iv (d) ii, iii, iv

79. Let f be a function satisfying $f\ (xy) = \dfrac{f\ (x)}{y}$ for all positive real numbers. If $f\ (500) = 3$, then what is $f\ (600)$?

(a) 2.0 (b) 3.6 (c) 2.5 (d) 4.0

80. The probability that a number in {1, 2, ..., 1001} is divisible by 7 or 11 or both, is

(a) $\dfrac{143}{1001}$ (b) $\dfrac{221}{1001}$ (c) $\dfrac{247}{1001}$ (d) $\dfrac{91}{1001}$

81. Let $f\ (x) = \sqrt{x + \sqrt{0 + \sqrt{x + \ldots}}}$. If $f\ (\alpha) = 4$, then $f'(\alpha)$ is

(a) 0 (b) 1 (c) $\dfrac{1}{7}$ (d) $\dfrac{1}{4}$

82. The system of linear equations

$$\begin{aligned} kx_1 + \lambda x_2 + \lambda x_3 + \lambda x_4 &= 0 \\ \lambda x_1 + kx_2 + \lambda x_3 + \lambda x_4 &= 0 \\ \lambda x_1 + \lambda x_2 + kx_3 + \lambda x_4 &= 0 \\ \lambda x_1 + \lambda x_2 + \lambda x_3 + kx_4 &= 0 \end{aligned}$$

has solution if and only if

(a) $k - \lambda \neq 0$ (b) $k - 3\lambda \neq 0$ (c) $(k - \lambda)(k - 3\lambda) \neq 0$ (d) $k + \lambda \neq 0$

83. $\int_0^{\pi} \min\ (\sin x, \cos x)\ dx$ equals

(a) $1 - \sqrt{2}$ (b) 1 (c) $1 - 2\sqrt{2}$ (d) 0

84. The projection of the vector $\hat{\mathbf{i}} + \hat{\mathbf{j}} + \hat{\mathbf{k}}$ on to $\hat{\mathbf{i}} - 2\hat{\mathbf{j}} + 3\hat{\mathbf{k}}$ is given by

(a) $\sqrt{13}$ (b) $\dfrac{6}{\sqrt{14}}$ (c) $2\hat{\mathbf{i}} - \hat{\mathbf{j}} + 4\hat{\mathbf{k}}$ (d) $\dfrac{2}{\sqrt{14}}$

85. Relative to the ellipse $x^2 + y^2 + xy = 7$, the point (2, 3) lies

(a) inside (b) outside

(c) on (d) Not possible to find without tracing the curve

86. $\int_a^b f\ (a - b - x)\ dx = \int_a^b y dx$, where y stands for

(a) $f\ (-x)$ (b) $-f\ (x)$ (c) $f\ (x)$ (d) $f\ (x) + f\ (-x)$

87. The third term of a geometric progression is 3. The product of first five terms is

(a) 143 (b) 27 (c) 243 (d) uncertain

88. The number of solutions to the equation $x^2 - 5|x| + 6 = 0$ is

(a) 2 (b) 4

(c) 6 (d) None of these

89. Let R be a rectangle. How many circles in the plane of R have a diameter both of whose end points are vertices of R ?

(a) 1 (b) 2 (c) 4 (d) 5

90. In a quadrilateral $ABCD$, it is given that $\angle A = 120^\circ$, angles B and D are right angles, $AB = 13$, and $AD = 46$. Then AC equals

(a) 62 (b) 64 (c) 65 (d) 72

91. The degree to which data in a database system are accurate and correct is referred to as

(a) data independence (b) data security (c) data privacy (d) data integrity

92. If $|\underset{\sim}{a}| = 2, |\underset{\sim}{b}| = 3, |\underset{\sim}{c}| = 4$ and $\underset{\sim}{a} + \underset{\sim}{b} + \underset{\sim}{c} = 0$, then the value of $\underset{\sim}{a} \cdot \underset{\sim}{b} + \underset{\sim}{b} \cdot \underset{\sim}{a} + \underset{\sim}{c} \cdot \underset{\sim}{a}$ is

(a) -25 (b) $\frac{21}{2}$ (c) $-\frac{21}{2}$ (d) $-\frac{29}{2}$

93. The value of $\tan 1^\circ \tan 2^\circ \tan 3^\circ \ldots \tan 89^\circ$ is

(a) 0 (b) 1 (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{3}$

94. If $\sin A + \sin B = p$ and $\cos A + \cos B = q$, then $\cos(A + B)$ equal

(a) $p^2 + q^2$ (b) $\frac{q^2 - p^2}{p^2 + q^2}$ (c) $\frac{q^2}{p^2 + q^2}$ (d) $\frac{p^2 - q^2}{p^2 + q^2}$

95. If $|z + 4| \leq 3$, then $|z + 1|$

(a) ≤ 4 (b) ≤ 5 (c) ≤ 6 (d) None of these

96. The slope of the normal at the point $(at^2, 2at)$ of the parabola $y^2 = 4ax$ is

(a) $\log t$ (b) $-t$ (c) t (d) $-at$

97. Frame relay networks were developed to add more features that X. 25 was not able to provide. Select the correct option.

(a) Connection-oriented, variable-bit rate real-time applications.

(b) Connection-oriented, constant-bit rate real-time applications

(c) Higher data rate at lower cost than X.25, reduced control overheads and bandwidth on demand

(d) All of the above

98. Two stations (located at a distance of 1 km) in a point to point network transmit the frames of size 100 bits at a data rate of 1 Mbps. The utilization of the channel for network is

(a) 98% (b) 95% (c) 93% (d) 90%

when signal travels at a velocity of 2×10^8 m/s.

99. For an interactive system it is more important to

(a) minimize variance in response time (b) minimize average response time

(c) minimize throughput (d) minimize average response time and throughput

100. For what value of k does $4x^2 + 8xy + ky^2 = 9$ represent a pair of straight lines ?

(a) 4 (b) 8 (c) -4 (d) 0

101. A bomb moving with velocity $10\hat{\mathbf{i}} + 2\hat{\mathbf{j}}$ explodes into two fragments. The smaller fragment with mass M flies with velocity $20\hat{\mathbf{i}} + 50\hat{\mathbf{j}}$. The velocity of the larger fragment with mass $3M$ is

(a) $20\hat{\mathbf{i}}$ (b) $20\hat{\mathbf{i}} - 42\hat{\mathbf{j}}$ (c) $\frac{(20\hat{\mathbf{i}} - 42\hat{\mathbf{j}})}{3}$ (d) $60\hat{\mathbf{i}} + 150\hat{\mathbf{j}}$

102. Let $X = \{1, 2, 3, \ldots, 10\}$ and $P = \{1, 2, 3, 4, 5\}$. The number of subsets Q of X such that $P \Delta Q = \{3\}$ is

(a) $2^4 - 1$ (b) 2^4 (c) 2^5 (d) 1

103. Let n be any integer. Then $n(n+1)(2n+1)$

(a) is a perfect square (b) is an integer multiple of 6

(c) is an odd number (d) None of these

104. The diagonal of the square $PQRS$ is $(a+b)$. The perimeter of a square with twice the area of $PQRS$ is

(a) $4(a+b)$ (b) $\sqrt{8}(a+b)$ (c) $2(a+b)$ (d) $8ab$

105. The maximum distance between two points of a unit cube is

(a) $\sqrt{3}$ (b) $\sqrt{2}+\sqrt{3}$ (c) $\sqrt{2}+1$ (d) 3

106. Using *LRU* replacement algorithm with 3 frames, the number of page faults that occur for the following reference string 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6 is

(a) 12 (b 15 (c) 18 (d) 20

107. To prevent deadlock which of the following cannot be disallowed ?

(a) Mutual exclusion (b) Hold and wait (c) No preemption (d) Circular wait

108. The speedup ratio of a pipeline processing over an equivalent non-pipeline processing that uses 4 segments (each segment takes 20 ns for computation of a task) is

(a) 3.00 (b) 3.88 (c) 3.05 (d) 3.98

when there are 100 tasks

109. If w is arbitrary and $\underline{r} \times \underline{w} = \underline{0}$, then

(a) $\underline{r} = k\underline{w}$ for some $k > 0$ (b) $\underline{r} = k\underline{w}$ for some $k < 0$

(c) $\underline{r} = \underline{0}$ (d) None of these

110. Which of the following is not an assumption of the binomial distribution ?

(a) All trials must be identical
(b) All trials must be independent
(c) Each trial must be classified as success or failure
(d) The probability of success is 0.5 in all trials

111. If x, y, z are in R^3 and linearly independent, which of the following is false ?

(a) $\{x, y, z\}$ forms a bases of R^3 (b) $x, x+y, x+y+z$ are linearly dependent

(c) $\sum_{j=1}^{3} \lambda_j x_j, \lambda_j \in R$ is their linear span (d) x and y are linearly independent

112. Which of the following is true for any real x ?

(a) $\cos(\sin x) \geq \sin(\cos x)$ (b) $\cos(\sin x) \leq \sin(\cos x)$

(c) $\cos(\sin x) = -\sin(\cos x)$ (d) None of the above

113. Which of the following is true about a linear programming problem ?

(a) If two distinct bases correspond to the same basic feasible solution x, then x is degenerate
(b) If there is an optimal solution at the vertex, then there is also a solution in the interior
(c) Optimal solution is unique
(d) There may exist feasible solutions, but not a basic feasible solution

114. $k = 0$
For $i_1 = 1$ to 10
For $i_2 = 1$ to i_1
For $i_3 = 1$ to i_2
$k = k + 1$
print k
What would be the value of k after the above program segment is executed ?

(a) 120 (b) 398 (c) 220 (d) 1000

115. The value of $\lim_{x \to 0} \dfrac{\int_0^{x^2} e^{t^2} dt}{x^2}$ is

(a) 0 (b) ∞ (c) 1 (d) $\dfrac{1}{2}$

116. Let $\bar{p}$, $\bar{q}$, $\bar{r}$ be three mutually perpendicular vectors of the same magnitude. If a vector $\bar{x}$ satisfies the equation

$\bar{p} \times ((\bar{x} - \bar{q}) + \bar{q} \times ((\bar{x} - \bar{r}) \times \bar{q}) + \bar{r} \times ((\bar{x} - \bar{p}) \times \bar{r}) = 0$ then $\bar{x}$, in terms of $\bar{p}$, $\bar{q}$ and $\bar{r}$, is

(a) $\bar{p} \times \bar{q} + \bar{q} \times \bar{r} + \bar{r} \times \bar{p}$ (b) $(\bar{p} + \bar{q} + \bar{r})$

(c) $(\bar{p} \times \bar{q}) \times \bar{r} + (\bar{q} \times \bar{r}) \times \bar{p} + (\bar{r} \times \bar{p}) \times \bar{q}$ (d) $\dfrac{(\bar{p} + \bar{q} + \bar{r})}{2}$

117. If $f(x) = (10 - x^{10})^{1/10}$, then $f[f(x)]$ is

(a) x^{10} (b) x (c) x^{20} (d) None of these

118. $\cos 20^o \cos 40^o \cos 60^o \cos 80^o$ equals

(a) $\dfrac{1}{4}$ (b) $\dfrac{1}{8}$ (c) $\dfrac{1}{16}$ (d) $\dfrac{1}{32}$

119. If $a^x = bc, b^y = ac, c^z = ab$, then $\dfrac{1}{1+x} + \dfrac{1}{1+y} + \dfrac{1}{1+z}$ equals

(a) 1 (b) 3 (c) 0 (d) $(a + b + c)$

120. If $\sqrt{3} + 1$ is a root pf the equation $3x^3 + ax^2 + bx + 12 = 0$, where a and b are rational numbers, then b equals

(a) – 12 (b) 6 (c) 5 (d) 2