

JNU MCA - 2008

1. Let $\{X_n\}$ and $\{Y_n\}$ denote two sequences of integers defined as follows :
 $X_0 = 1, X_1 = 1, X_{n+1} = X_n + 2X_{n-1}; n = 1, 2, \dots$
 $Y_0 = 1, Y_1 = 7, Y_{n+1} = 2Y_n + 3Y_{n-1}; n = 1, 2, \dots$
 How many terms are there which occur in both sequences ?
 (a) 1 (b) 3
 (c) 8 (d) None of these
2. Let I_A and I_B be indicator variables for the events A and B such that
 $I_A = \begin{cases} 1 & \text{if } A \text{ occurs} \\ 0 & \text{otherwise} \end{cases}$ $I_B = \begin{cases} 1 & \text{if } B \text{ occurs} \\ 0 & \text{otherwise} \end{cases}$
 The covariance of I_A and I_B is
 (a) $P(AB)$ (b) $P(AB) - P(A)P(B)$
 (c) $P(A)P(B)$ (d) $1 - P(A) - P(B)$
3. $\frac{1}{\sqrt{2}} \int |x| \exp \frac{(x-1)^2}{2} dx$ equals to
 (a) $\frac{2}{\sqrt{2}}$ (b) 0
 (c) $\frac{2}{\sqrt{2}}$ (d) $\frac{2}{\sqrt{2}}$
4. Two sides of a triangle are formed by the vectors $a = 3i + 6j + 2k$ and $b = 4i + j + 3k$. One of the angle of the triangle is given by
 (a) $\cos^{-1} \frac{7}{\sqrt{75}}$ (b) $\cos^{-1} \frac{3}{\sqrt{15}}$
 (c) $\cos^{-1} \frac{2}{3}$ (d) None of these
5. $\int \frac{\log x^2}{x} dx$ is equal to
 (a) $\frac{(\log x)^2}{2} + C$ (b) $\frac{(\log x)^2}{3} + C$
 (c) $\frac{(\log x)^2}{4} + C$ (d) $\frac{(\log x^2)^2}{4} + C$
6. If X_1 and X_2 are independent binomial variates with parameters $n_1 = 3, p_1 = \frac{1}{3}$ and $n_2 = 5, p_2 = \frac{1}{3}$, then $P(X_1 = X_2 = 1)$, is
 (a) $\frac{1}{16}$ (b) $\frac{2}{3^8}$
 (c) $1 - \frac{2}{3}$ (d) $\frac{1}{32}$
7. Structure is a programming language concept for aggregation of data using Cartesian product through conjunction of fields in most programming languages. Which one of the following is used for aggregation of data using Cartesian product through disjunction of its field ?
 (a) Array (b) Pointer
 (c) String (d) Union
8. If $A = 0, B = 0$ and $A = B = \frac{\pi}{3}$, then the maximum value of $\tan A \tan B$ is
 (a) 0 (b) $\frac{1}{3}$
 (c) 3 (d) None of these
9. $\int x \tan^{-1} x dx$ is equal to
 (a) $\frac{(x^2 - 1) \tan^{-1} x}{2} + C$
 (b) $\frac{(x^2 - 1) \tan^{-1} x - x}{2} + C$
 (c) $\frac{(x^2 - 1) \tan^{-1} x - x}{2} + C$
 (d) None of the above
10. If $d = (a, b), (b, c), (c, a)$ and $[a, b, c] = \frac{1}{8}$, then $\frac{d \cdot d}{[a, b, c]}$ is equal to
 (a) (a, b, c) (b) (a, b, c)
 (c) (a, b, c) (d) None of these
11. The volume of the tetrahedron whose vertices are the points with position vectors $i + 6j + 10k, i + 3j + 7k, 5i + j + k$ and $7i + 4j + 7k$ is 11 cubic units if the value of $\frac{1}{[a, b, c]}$ is
 (a) -1 (b) 1
 (c) -7 (d) None of these
12. If $z = x + iy, z^{1/3} = a + ib, a = ab, b = 0$, then $bx - ay = kab(a^2 - b^2)$ where k is equal to
 (a) 1 (b) 2
 (c) 3 (d) 4
13. The value of $\sum_{k=1}^{10} \sin \frac{2k}{11} - i \cos \frac{2k}{11}$ is
 (a) -1 (b) 0
 (c) -i (d) i

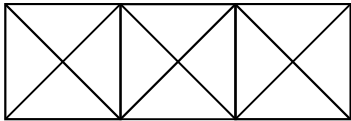
14. The value of a for which the quadratic equation $3x^2 - 2(1 - a^2)x + (a^2 - 3a - 2) = 0$ possesses roots of opposite sign lies in
 (a) $(-1, 1)$ (b) $(-1, 0)$
 (c) $(1, 2)$ (d) $(1.5, 2)$
15. The equation $\cos 2x = a \sin x - 2a - 7$ possesses a solution if
 (a) $a = 2$ (b) $2 < a < 6$
 (c) $a = 6$ (d) a is any integer
16. For $0 < a < \frac{\pi}{2}$, if $x = \cos^{2n} a$, $y = \sin^{2n} a$, $z = \cos^{2n} a \sin^{2n} a$, then
 (a) $xyz = xz = y$ (b) $x = y = z = xyz = 0$
 (c) $xyz = xy = z$ (d) $xy^2 = x^2y = z$
17. Two rays are drawn through a point at an angle of 30° . A point B is taken on one of them at a distance d from the point A . A perpendicular is drawn from the point B to the other ray and another perpendicular is drawn from its foot to meet AB at another point from where the similar process is repeated indefinitely. The length of the resulting infinite polygonal line is equal to
 (a) $d(2 - \sqrt{3})$ (b) $d(2 + \sqrt{3})$
 (c) infinite (d) None of these
18. The expression $\cos^2(A - B) - \cos^2 B - 2 \cos(A - B) \cos A \cos B$ is
 (a) dependent of A
 (b) dependent of B
 (c) dependent of A and B
 (d) None of these
19. If x is the value of $\tan 3A \cot A$, then
 (a) $x = 1$ (b) $\frac{1}{3} < x < 3$
 (c) $0 < x < 1$ (d) None of these
20. If $\tan A = \frac{5}{6}$ and $\tan B = \frac{1}{11}$, then
 (a) $A - B = \frac{\pi}{6}$ (b) $A - B = \frac{\pi}{4}$
 (c) $A - B = \frac{\pi}{3}$ (d) None of these
21. Choose one number which is similar to the numbers in the given set :
 4718, 5617, 6312, 8314
 (a) 2715 (b) 3410 (c) 5412 (d) 6210
22. The hexadecimal of 756.603 with base 8 is
 (a) 1EE.C18 (b) 2F4.25B
 (c) 3DD.83 (d) None of these
23. In a triangle, the lengths of the two larger sides are 10 and 9 respectively. If the angles are in AP, the length of the third side can be
 (a) $3\sqrt{5}$ (b) $5\sqrt{3}$
 (c) $5\sqrt{6}$ (d) None of these
24. If two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ cut the coordinate axes in concyclic points, then
 (a) $a_1a_2 - b_1b_2 = 0$ (b) $a_1a_2 - b_1b_2 = 0$
 (c) $a_1b_1 - a_2b_2 = 0$ (d) $a_1b_1 - a_2b_2 = 0$
25. Consider the following statements :
 (i) Static languages do not support recursion.
 (ii) The memory requirement for stack-based language such as ALGOL-60 can be estimated at compile time.
 (iii) Resolution of overloaded operators can be done at translation time.
 Which one of the following options is correct ?
 (a) (i) and (ii) are true
 (b) (i) and (iii) are true
 (c) (ii) and (iii) are true
 (d) (i), (ii) and (iii) are true
26. What will the following program do ?

```
# include <stdio.h>
main()
{
char*names[6];
int i;
for (i=0; i < 5; i++)
{
printf("\nEnter name");
scanf("%s", names[i]);
}
}
```

 (a) The program does not work properly
 (b) The program gives syntax error
 (c) The program reads 6 strings
 (d) None of the above
27. For a memory chip having capacity of 32 kilobytes, the minimum number of address lines required is
 (a) 5 (b) 10 (c) 15 (d) 32
28. Determine number from the give alternatives, having the same relation with this number as the numbers of the given pair bear in the given
 $7528 : 5362 :: 4673 : ?$
 (a) 2367 (b) 2451
 (c) 2531 (d) None of these

29. How many terms are there in the series 201, 208, 215,, 369 ?
 (a) 23 (b) 24 (c) 25 (d) 26
30. Let $R(ABCDEH)$ and $F \{A \ BC, CD \ E, E \ C, AH \ D\}$. Which of the following is not correct ?
 (a) A and H are prime
 (b) B, C, D and E are non-prime
 (c) AH is only candidate key
 (d) DE is only candidate key
31. A man said to a lady, "Your mother's husband's sister is my aunt." How is the lady related to the man ?
 (a) Daughter (b) Granddaughter
 (c) Mother (d) Sister
32. The solution $y = x \frac{dy}{dx} - \frac{dy}{dx}^3$ is
 (a) $ye^{\frac{1}{2}p^2} (1 - p^2)$
 (b) $y = p^3 e^{\frac{1}{2}p^2} (p - p^3)$
 (c) $y = p^3 e^{\frac{1}{2}p^2} (p + p^3)$
 (d) $ye^{\frac{1}{2}p^2} (1 + p^2)$
33. Let $a = a_1i + a_2j + a_3k$, $b = b_1i + b_2j + b_3k$ and $c = c_1i + c_2j + c_3k$ be three non-zero vectors such that c is a unit vector perpendicular to both a and b , if the angle between a and b is $\frac{p}{6}$.
 Then $\begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}^2$ is equal to
 (a) 0 (b) 1
 (c) $\frac{1}{4}(a_1^2 + a_2^2 + a_3^2)(b_1^2 + b_2^2 + b_3^2)$
 (d) $\frac{3}{4}(a_1^2 + a_2^2 + a_3^2)(b_1^2 + b_2^2 + b_3^2)$
 (c₁² + c₂² + c₃²)
34. Determine which of the following is not true :
 (i) The rate of convergence of Regula-Falsi method is 1
 (ii) The secant method, when it converges it does so with approximate rate of convergence 1.62
 (iii) Regula-Falsi method always converges
 (iv) Assume that initial guess is very close to the root, Newton-Raphson method always converges when applied to $f(x) = 0$
 (a) (i) (b) (ii) (c) (iii) (d) (iv)
35. Find all real numbers t for which the quadratic form Q defined by $Q(x_1, x_2, x_3) = 2x_1^2 + x_2^2 + 3x_3^2 + 2tx_1x_2 + 2x_1x_3$ is positive definite
 (a) $t = 1$ (b) $t = 0$
 (c) $|t| < \frac{5}{2}$ (d) $|t| < \frac{5}{3}$
36. Let $f(1) = 1$ and $f(n) = 2 \binom{n-1}{r-1} f(r)$. Then $\sum_{n=1}^m f(n)$ is equal to
 (a) $3^{m-1} - 1$ (b) $3^m - 1$
 (c) $3^m - 1$ (d) None of these
 $\sum_{n=1}^m x^n = \frac{x^{m+1} - x}{x - 1}$
37. $\lim_{x \rightarrow 1} \frac{x^r - 1}{x - 1}$ is equal to
 (a) $\frac{n}{2}$ (b) $\frac{n(n-1)}{2}$
 (c) 1 (d) None of these
38. $\int_0^{\pi} \sin x \cos 2x \, dx$ is equal to
 (a) 1 (b) 2 (c) 4 (d) 0
39. The area included between the parabola $y^2 = 4ax$ and $x^2 = 4ay$ is equal to
 (a) $\frac{8a^2}{3}$ (b) $\frac{16a^2}{3}$
 (c) $\frac{4a^2}{3}$ (d) None of these
40. Let a, b and c be three non-zero vectors such that $a \cdot b = c = 0$ and $|a| = 3, |b| = 5$ and $|c| = 7$. Then an angle between a and b is
 (a) 15° (b) 30° (c) 45° (d) 60°
41. If $x_r = \cos \frac{r}{2} + i \sin \frac{r}{2}$, then $x_1 x_2 x_3 \dots$ to x_n is equal to
 (a) -3 (b) -2
 (c) -1 (d) 0
42. If GIVE is coded as 5137 and BAT is coded as 924, how is GATE coded ?
 (a) 5427 (b) 5724
 (c) 5247 (d) 2547
43. The angle of elevation of a cloud from a point x meter above a lake is A and the angle of depression of its reflection in the lake is 45° . The length of the cloud is
 (a) $x \tan(A)$ (b) $x \tan(45^\circ)$
 (c) $x \tan(A + 45^\circ)$ (d) $x \cot(A + 45^\circ)$

44. The coordinates of A, B, C and D are $(6, 3), (-3, 5), (4, -2)$ and $(x, 3x)$ respectively. If the area of the triangle ABC is twice that of the triangle DBC , the value of x can be
- (a) $\frac{3}{8}$ (b) $\frac{11}{2}$ (c) $\frac{17}{8}$ (d) 4
45. The equation of a tangent to the parabola $y^2 = 8x$ which makes an angle 45° with the line $y = 3x + 5$ is
- (a) $2x - y - 1 = 0$ (b) $y - 2x - 1 = 0$
(c) $x - 2y - 8 = 0$ (d) None of these
46. Bob writes down a number between 1 and 1000. Mary must identify that number by asking 'yes/no' questions of Bob. Mary knows that Bob always tells the truth. If Mary uses an optimal strategy, then how many questions she must ask to determine the answer at the end in the worst case ?
- (a) 1000 (b) 999 (c) 10 (d) 32
47. How many triangles and squares are there in the following figure ?



- (a) 28 triangles 5 squares
(b) 24 triangles, 4 squares
(c) 28 triangles, 4 squares
(d) 24 triangles, 5 squares
48. AFHO : GBDM :: CHFM : ?
- (a) GBLD (b) GBJO (c) GPLD (d) GBDM
49. Which of the following is the fastest IPC mechanism ?
- (a) FIFO (b) Pipes
(c) Semaphore (d) Mailboxes
50. Which one of the following is not used to define the syntax rules of a programming language ?
- (a) Binary normal form (b) Backus - Naur form
(c) EBNF (d) Syntax diagram
51. Aamir walks 10 km towards North. From there he walks 6 km towards South. Then he walks 3 km towards East. How far and in which direction is he with reference to his starting point ?
- (a) 5 km North-West (b) 7 km West
(c) 7 km East (d) 5 km North-East
52. In a row of 21 boys, when Raj was shifted by four places towards the right, he became 12th from the left end. What was his earlier position from the right end of the row ?
- (a) 11th (b) 12th (c) 13th (d) 14th

53. Which of the following statements is/are correct ?
- (a) A heap is always a complete binary tree
(b) An AVL tree is always a binary search tree
(c) Full binary tree is a special case of complete binary
(d) All of the above
54. The 8-bit 2's complement of -45 is
- (a) 00101101 (b) 11010010
(c) 11010011 (d) 10101101
55. The instruction JNZ Label in Intel 8085.
- (a) Jump to Label if zero flag is set
(b) Jump to Label if zero flag is not set
(c) Jump to Label
(d) None of the above
56. A superkey such that set of its attributes (one or more than one) does not form a superkey is called
- (a) Candidate key (b) Primary key
(c) Foreign key (d) None of these
57. Six students A, B, C, D, E and F are sitting in the field. A and B are from Delhi while the rest are from Bangalore. D and F are tall while others are short. A, C and D are girls while others are boys. Which is the tall girl from Bangalore ?
- (a) C (b) D (c) E (d) F

58. The value of the integral $\int_0^1 x^{1/2} dx$ can be found by using
- (a) Trapezoidal rule (b) Simpson's rule
(c) Mid point rule (d) All of these
59. Consider a normalized floating point number in base b so that mantissa X satisfies the condition $(1/b) \leq X < 1$. Experience shows that X has the following probability density function $f_x(x) = \frac{k}{x}$, $k > 0$. The value of k is
- (a) 1 (b) \ln
(c) $\frac{1}{\ln}$ (d) None of these

60. Find the missing character from among the given alternatives :

?	1	2
21	22	40
1	2	5
20	23	43

- (a) 5 (b) 4 (c) 3 (d) 2

61. If $f(x+y) = f(x) + f(y) + xy - 1$ for all x, y and $f(1) = 1$, then the number of solutions of $f(n) = n$, $n \in \mathbb{N}$, is
 (a) one (b) two
 (c) four (d) None of these
62. $\lim_{n \rightarrow \infty} \frac{1}{1+n^2} + \frac{2}{1+n^2} + \dots + \frac{n}{1+n^2}$ is equal to
 (a) 0 (b) $\frac{1}{2}$
 (c) $\frac{1}{2}$ (d) None of these
63. If the line joining the points $(0, 3)$ and $(5, -2)$ is a tangent to the curve $y = \frac{c}{(x-1)}$, then the value of c is
 (a) 1 (b) -2
 (c) 4 (d) None of these
64. Let $f(x)$ be a continuous function such that $f(a-x) + f(x) = 0$ for all $x \in [0, a]$. Then $\int_0^a \frac{dx}{e^{f(x)}}$ is equal to
 (a) a (b) $\frac{a}{2}$ (c) $f(a)$ (d) $\frac{f(a)}{2}$
65. The degree of the differential equation satisfying $a(x+y) = \sqrt{1-x^2} + \sqrt{1-y^2}$
 (a) 1 (b) 2
 (c) 3 (d) None of these
66. A particle in equilibrium is subjected to four forces $F_1 = 10k, F_2 = \frac{u}{13}(4i + 12j + 3k), F_3 = \frac{v}{13}(4i + 12j + 3k)$ and $F_4 = w(\cos i + \sin j)$. The value of $u + v + w$ is given by
 (a) $40\text{cosec } \frac{130}{3}$ (b) $40\text{cosec } 130$
 (c) $130\text{cosec } 130$ (d) None of these
67. If $1, \omega, \omega^2, \dots, \omega^{n-1}$ are the n th roots of unity, then $(2 - \omega)(2 - \omega^2) \dots (2 - \omega^{n-1})$ equals to
 (a) $2^n - 1$
 (b) ${}^nC_1 + {}^nC_2 + \dots + {}^nC_n$
 (c) $[2^{n-1}C_0 + 2^{n-2}C_1 + \dots + 2^{n-1}C_n]^{1/2} - 1$
 (d) None of the above
68. If x is real and $k = \frac{x^2 + x + 1}{x^2 - x + 1}$, then
 (a) $\frac{1}{3} < k < 3$ (b) $k < 5$
 (c) $k < 0$ (d) None of these
69. If $\cot \theta = \tan \phi$ and $\frac{1}{\cos \theta} = \cos \phi$, then
 (a) $m(mn^2)^{1/3} + n(nm^2)^{1/3} = 1$
 (b) $m(nm^2)^{1/3} + n(mn^2)^{1/3} = 1$
 (c) $n(mn^2)^{1/3} + m(nm^2)^{1/3} = 1$
 (d) $n(nm^2)^{1/3} + m(mn^2)^{1/3} = 1$
70. In a pile of reading material, there are novels, story books, dramas and comics. Every novel has a drama next to it, every story book has a comic next to it and there is not story book next to a novel. If there be a novel at the top and the number of books be 40, the order of the books in the pile is
 (a) nscd (b) ndsc (c) csdn (d) dnsc
71. Each side of an equilateral triangle subtends an angle of 60° at the top of a tower h meter high located at the center of the triangle. If a is the length of each side of the triangle, then
 (a) $3a^2 = 2h^2$ (b) $2a^2 = 3h^2$
 (c) $a^2 = 3h^2$ (d) $3a^2 = h^2$
72. The lines $x + 2y + 6 = 0, 3x + y + 4 = 0$ and $x + 4y + 2 = 0$ are concurrent if k is equal to
 (a) 2 (b) -3
 (c) 4 (d) None of these
73. If the line $y = mx$ is one of the bisectors of the lines $x^2 + y^2 - 4xy = 0$, then the value of m is given by
 (a) $m = 1$ (b) $m^2 = m + 0$
 (c) $m^2 = m + 1 = 0$ (d) None of these
74. What would be the sequence of nodes in post order traversal are as under?
 Inorder : C D E B A
 Preorder : A B C D E
 (a) DEBCA (b) EDCAB
 (c) EDCBA (d) EDBCA
75. The output of the following program will be

```
#include <stdio.h>
main( )
{
  Char Ch[10];
  int i;
  for (i = 0; i < 9; i++)
    (ch+i) = 65;
  *(ch+i) = '/0';
  printf( "n%s", ch);
}
```

 (a) AAAAAAAAAA (b) BBBBBBBBBB
 (c) 6565656565656565656565656565 (d) None of these

76. The number of flip-flops required to design decade counter is
 (a) 3 (b) 4 (c) 5 (d) 10
77. The instruction LDA2000H in Intel 8085.
 (a) Loads data from memory location 2000H to register A
 (b) Loads data from memory location 2000H to register B
 (c) Loads data from memory location 2000H to register C
 (d) Loads data from memory location 2000H to register D
78. The degree of the Cartesian product of two relations P and Q is given by
 (a) $|P| * |Q|$ (b) $|P| + |Q|$
 (c) $\max(|P|, |Q|)$ (d) None of these
79. Let x_1, x_2, \dots, x_n be a random sample drawn from normal population with mean m and variance s^2 . Writing

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n} \text{ and } s^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}$$
 the statistics $\frac{(\bar{x} - m)}{s/\sqrt{n}}$ follows
 (a) t -distribution
 (b) normal distribution
 (c) chi-square distribution
 (d) F - distribution
80. If point is in motion on the curve $12y = x^3$, then ordinate is changing at a faster rate than the abscissa in the interval
 (a) $(-2, 2)$ (b) $(2, 4)$
 (c) $(-2, 0)$ (d) None of these
81. If $\int \cot^4 x dx = \frac{1}{3} \cot^3 x + \cot x + \frac{x}{2} + C$, then $\int \cot^2 x dx$ is
 (a) $\frac{x}{2} + C$ (b) $\frac{x}{2} + C$
 (c) $\frac{x}{2} + C$ (d) None of these
82. In a cricket match, five batsmen A, B, C, D and E scored an average of 36 runs. D scored 5 more than E ; E scored 8 fewer than A ; B scored as many as D and E combined and B and C scored 107 between the. How many runs did E score?
 (a) 20 (b) 45 (c) 28 (d) 62
83. Let $f(x) = ax^2 + bx + c$; $a, b, c \in \mathbb{R}$ and $a \neq 0$. Suppose $f(x) = 0$ for all $x \in \mathbb{R}$. Let $g(x) = f(x) + f'(x) + f''(x)$. Then
 (a) $g(x) = 0$, for all $x \in \mathbb{R}$
 (b) $g(x) = 0$, for all $x \in \mathbb{R}$
 (c) $g(x) = 0$ has real roots
 (d) None of the above
84. The value of the determinant

$$\begin{vmatrix} 1 & a & a^2 \\ \cos(n-1)x & \cos nx & \cos(n-1)x \\ \sin(n-1)x & \sin nx & \sin(n-1)x \end{vmatrix}$$
 is zero if.
 (a) $\sin x = 0$ (b) $\cos x = 0$
 (c) $a = 0$ (d) None of these
85. Two of the straight lines given by
 $3x^2 + 3x^2y + 3xy^2 + my^3 = 0$
 are at right angles if
 (a) $m = \frac{1}{3}$ (b) $m = \frac{1}{3}$
 (c) $m = 3$ (d) $m = 3$
86. Assume that an upper triangular matrix $a[0 \dots n-1, 0 \dots n-1]$ is stored in a linear array $b[0 \dots (n(n-1)/2) - 1]$ in lexicographical order. If $a[0, 0]$ is stored in $b[0]$, where is $a[30, 40]$ stored in b array for $n = 50$?
 (a) $b[1020]$ (b) $b[1076]$
 (c) $b[1075]$ (d) $b[1074]$
87. Which of the following statements is/are true?
 (a) Structures can be compared using $==$
 (b) Unions can be compared using $==$ to determine if they are equal
 (c) Structures are always passed to function by reference
 (d) All of the above
88. Which of the following shift registers will result in fast data transmission?
 (a) Serial in parallel out
 (b) Parallel in serial out
 (c) Parallel in parallel out
 (d) Serial in serial out
89. The simplified Boolean function for
 $F(x, y, z) = \sum(0, 2, 3, 4, 5, 6)$
 is
 (a) $\bar{A}\bar{B} + \bar{A}B + \bar{C}$ (b) $\bar{A}\bar{B} + \bar{A}B + \bar{C}\bar{B}$
 (c) $\bar{A}\bar{B} + \bar{A}B + \bar{C}\bar{B}$ (d) None of these

90. Let $X = BCD$ and X under $F = \{A \rightarrow BC, CD \rightarrow E, E \rightarrow C, D \rightarrow AEH, ABH \rightarrow BD, DH \rightarrow BC\}$. Then X of X under F is given by
 (a) ABCD (b) ABEH
 (c) CDEH (d) ABCDEH
91. Subway trains on a certain line run every half hour between midnight and six in the morning. Find the probability that a person entering the station at a random time during this period will have to wait at least twenty minutes.
 (a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{1}{3}$ (d) $\frac{1}{6}$
92. X is a random variable with p.d.f. $f(x) = \frac{1}{2}a^x$, $0 < x < a$. $E(e^{tX})$ equals to
 (a) $\frac{\sinh(at)}{at}$ (b) e^{at}
 (c) $e^{at} - e^{-at}$ (d) $\cosh(at)/at$
93. The value of $\lim_{x \rightarrow 1} \sin^{-1} \log_3 \frac{x}{3}$ is equal to
 (a) $-\frac{\pi}{2}$ (b) $\frac{\pi}{2}$
 (c) 0 (d) None of these
94. If there is an error of $k\%$ in measuring the edge of a cube, then the percent error in estimating its volume is
 (a) k (b) $3k$ (c) $\frac{k}{3}$ (d) k^3
95. The solution of differential equation $(x - y)^2 \frac{dy}{dx} = a^2$ is
 (a) $y = \frac{a}{2} \log \left| \frac{x - y - a}{x - y + a} \right| + C$
 (b) $x = \frac{a}{2} \log \left| \frac{x - y - a}{x - y + a} \right| + C$
 (c) $y^2 = a \log \left| \frac{x - y - a}{x - y + a} \right| + C$
 (d) None of the above
96. If a and b are two unit vectors, then the vector $(a + b) \times (a - b)$ is parallel to the vector
 (a) $a \times b$ (b) $a \cdot b$ (c) $2a \times b$ (d) $2a \cdot b$
97. In a triangle ABC , if $\tan(A/2) = 5/6$ and $\tan(B/2) = 20/37$, the sides a, b and c are in
 (a) AP (b) GP
 (c) HP (d) None of these
98. The equation of the circle through $(1, 1)$ and the points of intersection of $x^2 + y^2 - 13x - 3y = 0$ and $2x^2 + 2y^2 - 4x - 7y - 25 = 0$ is
 (a) $4x^2 + 4y^2 - 30x - 10y - 32 = 0$
 (b) $4x^2 + 4y^2 - 30x - 13y - 25 = 0$
 (c) $4x^2 + 4y^2 - 30x - 13y - 25 = 0$
 (d) None of the above
99. What will be the output of the following program?

```
String s1, s2;
if (strcmp(s1, s2))
printf("strings are equal");
```

 (a) Does not print anything
 (b) Output will be - the strings are equal
 (c) Gives syntax error
 (d) Gives unpredictable output
100. The minimum number of nodes in an AVL (Height Balanced binary tree) of height 6 is
 (a) 20 (b) 33 (c) 24 (d) 36
101. What is the extension of output of the Compiler?
 (a) .obj (b) .asm (c) .exe (d) .c
102. The sum of the income of A and B is more than that of C and D taken together. The sum of the income of A and C is the same as that of B and D taken together. Moreover, A earns half as much as the sum of the income of B and D . Which of the following statements is not correct?
 (a) $A < B$ (b) $A < C$ (c) $A < D$ (d) $A < B + C$
103. The interval which contains the eigen values of the symmetric matrix.

$$A = \begin{pmatrix} 3 & 2 & 2 \\ 2 & 2 & 5 \\ 2 & 5 & 2 \end{pmatrix}$$
 (a) $(2, 9)$ (b) $(-1, 9)$
 (c) $(1, 8)$ (d) $(-1, 7)$
104. The train for Kanpur leaves every two and a half hours from New Delhi Railway Station. An announcement was made at the station that the train for Kanpur had left 40 minutes ago and the next train will leave at 18:00 hrs. At what time was the announcement made?
 (a) 15 : 30 hrs (b) 17:10 hrs
 (c) 16:00 hrs (d) None of these
105. If $\frac{a_0}{n-1} - \frac{a_1}{n} + \frac{a_2}{n-1} - \dots + \frac{a_{n-1}}{2} - a_n = 0$, then the function $a_0 x^n + a_1 x^{n-1} + a_2 x^{n-2} + \dots + a_n$ has in $(0, 1)$
 (a) at least one zero (b) at most one zero
 (c) only 3 zeros (d) only 2 zeros

106. $\int x e^{x^2} \cos(e^{x^2}) dx$ is equal to
 (a) $2 \sin(e^{x^2}) + C$ (b) $\sin(e^{x^2}) + C$
 (c) $\frac{1}{2} \cos(e^{x^2}) + C$ (d) $\frac{1}{2} \sin(e^{x^2}) + C$
107. In a certain office, $\frac{1}{3}$ of the workers are women, $\frac{1}{2}$ of the women are married and $\frac{1}{3}$ of the married women have children. If $\frac{3}{4}$ of the men are married and $\frac{2}{3}$ of the married men have children, what part of workers are without children?
 (a) $\frac{5}{18}$ (b) $\frac{4}{9}$ (c) $\frac{11}{18}$ (d) $\frac{17}{36}$
108. If $\frac{\tan^{-1}(\sin(\theta/2) \cos(\theta/2))}{1 - 2i \sin(\theta/2)}$ is purely imaginary, then θ is not given by
 (a) $n - \frac{\pi}{4}$ (b) $n - \frac{\pi}{2}$ (c) $2n - \frac{\pi}{4}$ (d) $2n - \frac{\pi}{2}$
109. If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$, ($abc \neq 0$) is equal to sum of the squares of their reciprocals, then $\frac{a}{c}, \frac{b}{a}, \frac{c}{b}$ are in
 (a) AP (b) GP (c) HP (d) None
110. The line $y = x + 5$ does not touch
 (a) the parabola $y^2 = 20x$
 (b) the ellipse $9x^2 + 16y^2 = 144$
 (c) the hyperbola $4x^2 - 29y^2 = 116$
 (d) the circle $x^2 + y^2 = 25$
111. In the following C fragment with reference to i and j , which one of the following statements is true?

```
int x = 0; int *i=&x; int *j=&x;
```


 (a) i and j are overloaded
 (b) i and j exhibit polymorphism
 (c) i and j are aliases
 (d) Value of i and j are always equal
112. (i) All children are inquisitive. (ii) Some children are inquisitive. (iii) No children are inquisitive. (iv) Some children are not inquisitive. find out which two statements cannot be true simultaneously, but can both be false.
 (a) (i) and (iii) (b) (ii) and (iii)
 (c) (i) and (iv) (d) (iii) and (iv)
113. A cube is colored in such a way that each pair of its adjacent sides have the same color. What is the minimum number of colors you require?
 (a) 2 (b) 3
 (c) 4 (d) None of these
114. Ravi is not wearing white and Ajay is not wearing blue. Ravi and Sohan wear different colors. Sachin alone wears red. What is Sohan's color, if all four of them are wearing different colors?
 (a) Red (b) Blue
 (c) White (d) Can't say
115. The maximum value of the step-size h that can be used in the tabulation of $f(x) = \sin(x)$ in the interval $[1, 3]$ so that the error in linear interpolation is less than equal to 1.25×10^{-7} is
 (a) .1 (b) .01
 (c) .001 (d) .0001
116. We define $\binom{r}{k} = \frac{r(r-1)\dots(r-k+1)}{k(k-1)\dots(1)}$, when k is non-negative and $\binom{r}{k} = 0$, when k is negative. Thus, $\sum_{k=0}^{\infty} \binom{7.2}{k}$ equals to
 (a) 0 (b) 29.52 (c) 1.52 (d) 2
117. Suppose the random variable X has the density function $f(x) = (1-x)^x, 0 \leq x \leq 1$
 0 , otherwise
 the maximum likelihood estimate of θ based on a given random sample $X_1 = x_1, X_2 = x_2, \dots, X_n = x_n$ is
 (a) $\hat{\theta} = \frac{n}{\sum_{i=1}^n x_i}$ (b) $\hat{\theta} = \frac{n}{\sum_{i=1}^n \ln x_i}$
 (c) $\hat{\theta} = 1 - \frac{n}{\sum_{i=1}^n x_i}$ (d) $\hat{\theta} = 1 - \frac{n}{\sum_{i=1}^n \ln x_i}$
118. The function g defined for all real x by $g(x) = e^x - 1 - x$ has a minimum value
 (a) -5 (b) -3
 (c) 0 (d) 1
119. Suppose an interactive computer system is proposed for which it is estimated that the mean response time $E(T) = 0.5$ sec and standard deviation $\sigma = 0.1$ sec. Using Chebyshev's inequality, the probability $P[|T - 0.5| \leq 0.25]$ is
 (a) 0.16 (b) 0.84
 (c) 0.25 (d) 0.75
120. X is a normal variate with mean μ and variance σ^2 . The value of $E(e^{X-\mu})$ is
 (a) $e^{-\sigma^2/2}$ (b) $e^{\sigma^2/2}$
 (c) $e^{-\sigma^2}$ (d) $(e^{-\sigma^2/2})^2$