

JNU : MCA Entrance : 2007

No. of Questions : 120

Maximum Marks : 480

Time Allowed : 3hrs

- 1 Consider the following functions of a complex variable

$$f_1(z) = (R_e(z^2))^2 / |z|^2 \text{ if } z \neq 0 \\ = 0 \text{ if } z = 0$$

and $f_2(z) = |z|^2$, where $R_e(z)$ is the real part of z .

Let the two statements

- (I) $f_1(z)$ is continuous at $z = 0$
(II) $f_2(z)$ is analytic at $z = 0$

Of the following, identify the correct statement

- (1) I is true but II is false
(2) II is true but I is false
(3) Both I and II are true
(4) Both I and II are false

- 2 If X is uniformly distributed over $(0, 10)$, the probability that $1 < X < 6$ is

- (1) $3/10$
(2) $1/10$
(3) $5/10$
(4) None of these

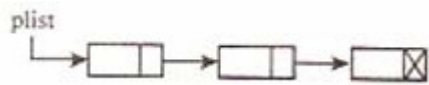
- 3 The area of triangle formed by the vertices $(p, q+r)$, $(q, p+r)$, $(r, p+q)$ is

- (1) $p+q+r$
(2) $pq + qr + rp$
(3) 0
(4) None of these

- 4 The volume of the tetrahedron included between the plane $3x + 4y - 5z = 60$ and the co-ordinate plane in the cubic unit is

- (1) 60
(2) 600
(3) 720
(4) None of these

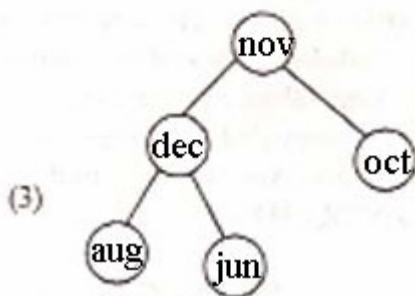
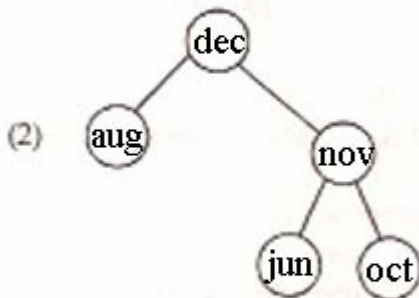
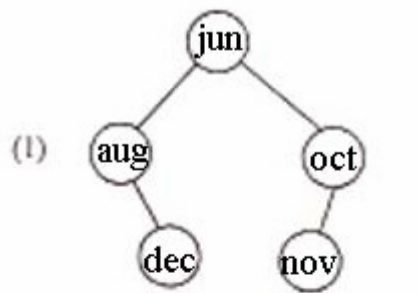
- 5 What would happen if we apply the following statements to the linked list as below ?



```
temp = plist
loop (temp->link not null)
temp = temp->link
endloop
temp->link = plist
```

- (1) List will become circular
(2) Last element will be deleted
(3) plist will point to last node
(4) None of these
- 6 The length of the line joining two points on the parabola $y^2 = x$ which is bisected at (1, 2) is
- (1) $\sqrt{51}$
(2) $3\sqrt{51}$
(3) $4\sqrt{51}$
(4) $2\sqrt{51}$
- 7 If $a = i + j + k$, $a \cdot b = 1$, $a \times b = j - k$, then b is equal to
- (1) $2i$
(2) i
(3) $2i - j$
(4) $2i - k$
- 8 The shortest distance of (0, 0) from the curve $y = \frac{e^x + e^{-x}}{2}$ is
- (1) $1/2$
(2) 1
(3) 2
(4) None of these
- 9 In an arithmetic progression, the first term is 2, the last term is 29 and the sum is 155. The difference is
- (1) 3
(2) 5
(3) 4
(4) 2

- 10 The AVL Tree (Height Balanced Tree) corresponding to the input sequence "jun, aug, dec, nov, oct" is



- (4) None of these
- 11 In an undirected complete graph with 5 vertices, the number of edges must be equal to
- (1) 5
 - (2) 10
 - (3) 20
 - (4) 15
- 12 Let $f: R \rightarrow R$ and $f(x) = \log_e x$, R being the set of real numbers then
- (1) f is onto
 - (2) f is one-one
 - (3) f is invertible
 - (4) None of these

13 Assume that either $|z| = 1$ or $|\omega| = 1$ and $\bar{z}\omega \neq 1$, where z, ω are complex numbers and \bar{z} is the conjugate of z . The value of $\left| \frac{z - \omega}{1 - z\omega} \right|$ is

- (1) $\sqrt{2}$
- (2) $\sqrt{3}$
- (3) $\sqrt{3/2}$
- (4) None of these

14 The number of solutions of $10^{2/x} + 25^{1/x} = \left(\frac{65}{8}\right)(50^{1/x})$ is

- (1) zero
- (2) four
- (3) two
- (4) infinite

15 The quadratic equation whose roots are reciprocal of the roots of the equation $x^3 - 3x + 2 = 0$ is

- (1) $3x^2 - 2x + 1 = 0$
- (2) $2x^2 - x - 1 = 0$
- (3) $x^2 - 3x + 2 = 0$
- (4) None of these

16 A student is allowed to select at the most n books from a collection of $(2n + 1)$ books. If the total number of ways in which he can select a book is 63, the value of n is

- (1) 1
- (2) 7
- (3) 5
- (4) 3

17 The sum of the series $1 + \frac{5}{3} + \frac{5}{3} \cdot \frac{7}{6} + \frac{5}{3} \cdot \frac{7}{6} \cdot \frac{9}{8} \dots$ is equal to

- (1) $3\sqrt{2}$
- (2) $9\sqrt{3}$
- (3) $5\sqrt{7}$
- (4) None of these

18 The value of $\frac{\log_2 24}{\log_{36} 2} - \frac{\log_2 192}{\log_{12} 2}$ is

- (1) 0
- (2) 1

- (3) 2
- (4) 3

19 If $P(n)$ is the statement “ $n(n + 1)(n + 2)$ is divisible by 12”, then which of the following is not true ?

- (1) $P(2)$
- (2) $P(3)$
- (3) $P(4)$
- (4) $P(5)$

20 Let f be a function defined on $[0, 2]$, then the function $g(x) = f(9x^2 - 1)$ has domain

- (1) $[0, 2]$
- (2) $[-1/3, 1/3]$
- (3) $[-3, 3]$
- (4) None of these

21 If a, b, c are the sides of a triangle, then the value of the expression

$$\frac{a}{b+c} + \frac{b}{c+a} + \frac{c}{a+b} \text{ is equal to}$$

- (1) 1
- (2) $3/2$
- (3) 2
- (4) $5/2$

22 The number of distinct terms in the expansion of $(x^1 + x^2 + x^3 + \dots + x^1)^3$ is

- (1) ${}^{n+1}C_3$
- (2) ${}^{n+2}C_3$
- (3) ${}^{n+3}C_3$
- (4) ${}^{n+4}C_3$

23 The sum of the series $\frac{\cos \theta}{4} + \frac{\cos 2\theta}{4^2} + \frac{\cos 3\theta}{4^3} + \dots$ will be equal to

- (1) $\frac{4 \cos \theta - 1}{17 - 8 \cos \theta}$
- (2) $\frac{2 \cos \theta + 4}{19 - \cos \theta}$
- (3) $\frac{\cos \theta}{2 + \cos \theta}$

(4) None of these

24 The number of real solutions of the equation $\tan^{-1} \sqrt{x(x+1)} + \sin^{-1} \sqrt{(x^2 + x + 1)} = \pi/2$ is

- (1) zero
- (2) one
- (3) two
- (4) infinite

25 Let the two statements

(I) $\sin 100 \sin 500 \sin 700 = 1/8$

(II) If $\frac{\cos \theta}{a} = \frac{\sin \theta}{b}$, then $\frac{a}{\sec 2\theta} + \frac{b}{\operatorname{cosec} 2\theta} = a$

Of the following, identify the correct statement

- (1) Both I and II are true
- (2) Both I and II are false
- (3) I is true but II is false
- (4) I is false but II is true

26 The number of solutions of the equation $\tan x + \sec x = 2 \cos x$ lying in the interval of $[0, 2\pi]$ is

- (1) 0
- (2) 1
- (3) 2
- (4) 3

27 The statement $p \rightarrow q$ is equivalent to

- (1) $\sim p$ conjunction q
- (2) $\sim p$ disjunction q
- (3) p conjunction $\sim q$
- (4) p disjunction $\sim q$

28

If for a triangle ABC, $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = 0$, then $\sin^3 A + \sin^3 B + \sin^3 C$ is equal to

- (1) $\sin A + \sin B + \sin C$
- (2) $3 \sin A \sin B \sin C$
- (3) $\sin 3A + \sin 3B + \sin 3C$
- (4) $\sin^3 A \sin^3 B \sin^3 C$

29 A ship arrives at a port and 40 sailors on board go ashore for revelry. Later at night, the 40 sailors return to the ship and in their state of inebriation, each chooses a

random cabin to sleep in. What is the expected number of sailors sleeping in their own cabin ?

- (1) $1/40$
- (2) $1/4$
- (3) $(1/40)^{10}$
- (4) None of these

30 The complete solution of the equation $7\cos^2x + \sin x \cos x - 3 = 0$ is given by

- (1) $n\pi + \pi/2 \quad (n \in \mathbb{Z})$
- (2) $n\pi - \pi/2 \quad (n \in \mathbb{Z})$
- (3) $n\pi + \tan^{-1}(4/3) \quad (n \in \mathbb{Z})$
- (4) $n\pi + 3\pi/4, k\pi + \tan^{-1}(4/3) \quad (n, k \in \mathbb{Z})$

31 The chance of throwing 12 in a single throw with three dice is

- (1) $12/216$
- (2) $21/216$
- (3) $15/216$
- (4) $25/216$

32 If $\int_0^{\pi/2} \frac{dx}{5+3\sin x} = \lambda \tan^{-1}\left(\frac{1}{2}\right)$, then the value of λ is given by

- (1) 1
- (2) $1/2$
- (3) $1/3$
- (4) $1/4$

33 Using hamming code error detection with the information bit size of five bits the size of the total message using parity bits becomes

- (1) 6
- (2) 7
- (3) 8
- (4) 9

34 Suppose there are 15 different types of coupons and suppose that each time one obtains a coupon, it is equally likely to be any one of the 15 types. The expected number of different types that are contained in that set of 5 coupons is

- (1) $15 \left[1 - \left(\frac{14}{15}\right)^5 \right]$
- (2) $15 \left[1 - \left(\frac{14}{15}\right) \right]^5$

(3) $5 \left[1 - \left(\frac{14}{15} \right) \right]^5$

(4) None of these

35 The joint density of X and Y is given by

$$f(x, y) = \begin{cases} \frac{1}{2} ye^{-xy}, & 0 < x < \infty, 0 < y < 2 \\ 0, & \text{otherwise} \end{cases}$$

The value of $\left[e^{x/2} \mid Y = 1 \right]$

(1) e^{-x}

(2) 1

(3) 2

(4) e^x

36 The degree and order of differential equation

$$\sqrt{2 \left(\frac{dy}{dx} \right)^3 + 4} = \left(\frac{d^2y}{dx^2} \right)^{3/2} \text{ are respectively}$$

(1) order 2, degree 3

(2) order 1, degree 3

(3) order 3, degree 2

(4) order 3, degree 1

37 If the sum of the areas of a cube and sphere is constant, the ratio of an edge of the cube to the diameter of the sphere, when the sum of their volume is minimum, is

(1) 1 : 2

(2) 2 : 1

(3) 1 : 3

(4) None of these

38 The orthocenter of the triangle with vertices $(0, 0)$, $(3, 0)$, $(0, 4)$ is

(1) $(0, 0)$

(2) $(3/2, 2)$

(3) $(1, 4/3)$

(4) None of these

39 How many ROM bits would be required to build an 8-bit adder/ subtractor with mode control, carry input, carry output and two's complement overflow output?

(1) $2^{12} * 10$

- (2) $2^{14} * 10$
- (3) $2^{16} * 10$
- (4) $2^{18} * 10$

40 A straight line is drawn through the centre O of the circle $x^2 + y^2 = 2ax$ parallel to $x + 2y = 0$ and intersecting the circle at A and B . The area of the ΔAOB is

- (1) $\frac{a^2}{\sqrt{5}}$
- (2) $\frac{a^3}{\sqrt{5}}$
- (3) $\frac{a^2}{\sqrt{3}}$
- (4) $\frac{a^2}{\sqrt{2}}$

41 The area of the portion of the circle $x^2 + y^2 - 4y = 0$ lying below the x -axis is

- (1) 24π
- (2) 42π
- (3) 82π
- (4) 0

42 If $ax + hy + gz = 0$, $hx + by + fz = 0$, $gx + fy + cz = 0$, then

- (1) $\frac{x^2}{bc - f^2} = \frac{y^2}{ca - g^2} = \frac{z^2}{ab - h^2}$
- (2) $(bc - f^2)(ca - g^2)(ab - h^2) = (fg - ch)(gh - af)(hf - bg)$
- (3) $(bc - f^2)(ca - g^2)(ab - h^2) = (fg + ch)(gh + af)(hf + bg)$
- (4) $(bc + f^2)(ca + g^2)(ab + h^2) = (fg - ch)(gh - af)(hf - bg)$

43 Which one of the following is an invalid state in an 8421 counter?

- (1) 1100
- (2) 0010
- (3) 0101
- (4) 1000

44 The parametric equations $x = \frac{a}{2}(\lambda + 1/\lambda)$; $y = \frac{b}{2}(\lambda - 1/\lambda)$ where λ is a parameter, represents

- (1) a straight line

- (2) a parabola
- (3) an ellipse
- (4) a hyperbola

45 If two forces act at a given point, the resultant of these forces can never have

- (1) The magnitude of either of these forces
- (2) The direction of either of these forces
- (3) a magnitude that is less than that of either of these forces
- (4) a magnitude that is greater than the algebraic sum of these forces.

46 To implement the expression $\overline{ABCD} + ABC\overline{D} + \overline{A}BCD$, is take one OR gate and

- (1) one AND gate
- (2) three AND gates
- (3) three AND gates and four inverters
- (4) three AND gates and three inverters

47 If the foci of the ellipse $\frac{x^2}{25} + \frac{y^2}{b^2} = 1$ and the hyperbola $\frac{x^2}{144} + \frac{y^2}{81} = \frac{1}{25}$ coincide, then the value of b^2 is

- (1) 3
- (2) 16
- (3) 9
- (4) 12

48 What will be the effect of the following program in C?

```
# include <stdio.h>
main( )
{
int a [10], *p;
p=a;
a[0] = 1;
a[1] = 2;
(*p)++;
return (0)
}
```

- (1) Value of a[0] will be 1 and a[1] will be 2
- (2) Value of a[0] will be 2 and a[1] will be 2
- (3) Value of a[0] will be 1 and a[1] will be 3
- (4) Value of a[0] will be 3 and a[1] will be 3

49 If a line makes angles α, β, δ with four diagonals of a cube, then $\cos^2 \alpha + \cos^2 \beta + \cos^2 \delta$ is equal to

- (1) $1/3$
(2) $2/3$
(3) $4/3$
(4) $8/3$
- 50 A J - K flip-flop with $J = 1$ and $K = 1$ has a 10-kHz clock input. The output is
- (1) constantly high
(2) constantly low
(3) a 10-kHz square wave
(4) a 5-kHz square wave
- 51 Equation of a common tangent to the curves $y^2 = 8x$ and $xy = -1$ is
- (1) $3y = 9x + 2$
(2) $y = 2x + 1$
(3) $2y = x + 8$
(4) $y = x + 2$
- 52 In the microprocessor 8085, the temporary register holds
- (1) temporary results during program execution
(2) next address for execution
(3) one of the operands needed for execution
(4) status information
- 53 The greatest distance of point $P(10, 7)$ from the circle $x^2 + y^2 - 4x - 2y - 20 = 0$ is
- (1) 10
(2) 15
(3) 5
(4) 20
- 54 Let $a = i + 2j + k$, $b = i - j + k$, $c = i + j - k$. A vector in the plane of a and b whose projection on c is $1/\sqrt{3}$, is
- (1) $4i - j + 4k$
(2) $2i + j - 2k$
(3) $3i + j - 3k$
(4) $4i + j - 4k$
- 55 On a Karnaugh map, grouping the 0's produces
- (1) a POS expression
(2) an SOP expression

- (3) AND-OR logic
- (4) a 'don't care' condition

56 The value of p such that the unit vectors $\vec{a} = \frac{2\hat{i} + p\hat{j} + \hat{k}}{\sqrt{5 + p^2}}$ and $\vec{b} = \frac{\hat{i} - 2\hat{j} + 3\hat{k}}{\sqrt{14}}$ are orthogonal is

- (1) 2/5
- (2) 5/2
- (3) 3/7
- (4) 2/7

57 If A and B are coefficients of x^n in the expansions of $(1 + x)^{2n}$ and $(1 + x)^{2n-1}$ respectively, then A/B is equal to

- (1) 1
- (2) 2
- (3) 1/2
- (4) 1/n

58 Assuming that ϕ is the angle of friction, the least force which moves a weight W along a rough horizontal plane is

- (1) $W \sin \phi$
- (2) $W \cos \phi$
- (3) $W \tan \phi$
- (4) None of these

59 The centre of gravity of the volume formed by the revolution of the portion of the parabola $y^2 = 4ax$, cut off by the ordinate $x=h$ along x -axis is

- (1) $\bar{x} = \frac{1}{4}h, \bar{y} = 0$
- (2) $\bar{x} = \frac{3}{4}h, \bar{y} = 0$
- (3) $\bar{x} = 0, \bar{y} = \frac{2}{3}h$
- (4) $\bar{x} = \frac{2}{3}h, \bar{y} = 0$

60 With every bit added the magnitude of the number

- (1) increases by 2
- (2) decreases by 2
- (3) multiplies by 2

(4) divides by 2

61 A uniform chain of length L and mass M is lying on a smooth table and one-third of its length is hanging vertically down over the edge of the table. If g is the acceleration due to gravity, the work required to pull the hanging part on the table is

- (1) MgL
- (2) $MgL/3$
- (3) $MgL/9$
- (4) $MgL/18$

62 $\int_0^1 \frac{3x}{(x+1)(x-2)} dx$ is given by

- (1) $\log 2$
- (2) $1/3 \log 2$
- (3) $1/2 \log 2$
- (4) $\log 1/2$

63 Is it possible for the processes to complete their execution without entering deadlock in any unsafe system ?

- (1) Not possible
- (2) Possible but not permissible
- (3) Possible and permissible
- (4) None of these

64 In the rational Q , the sequence $1, -2, 3, -4, 5, -6, \dots$ is

- (1) a Cauchy sequence
- (2) bounded
- (3) convergent
- (4) None of these

65 Let A and B be non-empty subsets of real line R . Which of the following statements would be equivalent to $\sup(A) \leq \inf(B)$?

- (1) For every a in A there exists a, b in B such that $a \leq b$
- (2) There exists a in A and b in B such that $a \leq b$
- (3) For every a in A and every b in B , we have $a \leq b$
- (4) There exists a in A such that $a \leq b$ for all b in B

66 In a buddy memory management, memory is divided into

- (1) fixed size frames
- (2) variable size frames

- (3) frame size in some powers of 2
- (4) contiguous allocation

67 Let $f : (1,5) \rightarrow R$ be a uniformly continuous function such $f(2) = 3$ and $f(4) = 6$.
The most we can say about the set $f((1,5))$ is that

- (1) it is a set which contains $[3, 6]$
- (2) it is a bounded set which contains $[3, 6]$
- (3) it is an open interval
- (4) it is an interval which contains $[3, 6]$

68 What expresses the specific number of entity occurrences associated with one occurrence of the related entity?

- (1) Connectivity
- (2) Cardinality
- (3) Degree
- (4) None of these

69 If E is the union of a Borel set and a null set, the best one can say about E is that it is

- (1) a Lebesgue measurable set
- (2) a Borel set
- (3) an arbitrary set
- (4) a G-delta set

70 If $x : y = 3 : 4$, then the ratio of $7x - 4y : 3x + y$ is

- (1) 5/18
- (2) 13/18
- (3) 5/13
- (4) None of these

71 If y varies as the sum of two quantities of which one varies directly as x , and if $y=6$ when $x=4$, and $y=10/3$ when $x=3$; the equation between x and y is

- (1) $y = x - 4/x$
- (2) $y = 2x - 4/x$
- (3) $y - x - 8/x$
- (4) None of these

72 If $\sqrt{\log_2 x} - 0.5 = \log_2 \sqrt{x}$, the x equals

- (1) 4
- (2) 8
- (3) 16

- (4) None of these
- 73 In a paged memory system, with page size of 1 K and logical address of 18 bits, how many pages are possible?
- (1) 512
(2) 1024
(3) 256
(4) 2096
- 74 The solution of the equation $(2x + y + 1)dx + (4x + 2y - 1)dy = 0$ is
- (1) $\log(2x + y - 1) = C + x + y$
(2) $\log(4x + 2y - 1) = C + 2x + y$
(3) $\log(2x + y + 1) + x + 2y = C$
(4) $\log(2x + y - 1) + x + 2y = C$
- 75 The value of $\sin(\tan^{-1}(1/3)) + \cos(\tan^{-1} 2\sqrt{2})$ is
- (1) 12/13
(2) 13/14
(3) 14/15
(4) None of these
- 76 A relation R is said to be partial order if
- (1) R is reflexive, symmetric and transitive
(2) R is reflexive, asymmetric and transitive
(3) R is reflexive, antisymmetric and transitive
(4) R is reflexive, antisymmetric but not transitive
- 77 The angle of the elevation of the sun when the length of the shadow of the pole is $\sqrt{3}$ times the height of the pole is
- (1) 30°
(2) 45°
(3) 60°
(4) 135°
- 78 If the sum of m terms to the sum of n terms in an AP is m^2 to n^2 , then the m th term to the n th terms is
- (1) $m - 1 : n - 1$
(2) $2m + 1 : 2n + 1$
(3) $2m - 1 : 2n - 1$

(4) None of these

79 The sum of infinite series $1 + 3x + 6x^2 + 10x^3 + \dots, x < 1$ is

(1) $\frac{1}{1-3x}$

(2) $\frac{1}{1-x^3}$

(3) $\frac{1}{1-x^2}$

(4) $\frac{1}{(1-x)^3}$

80 If $f(x) = \begin{vmatrix} \sin^2 \theta & \cos^2 \theta & x \\ \cos^2 \theta & x & \sin^2 \theta \\ x & \sin^2 \theta & \cos^2 \theta \end{vmatrix} \theta \in (0, \pi/2)$ then roots of $f(x) = 0$ are

(1) $1/2, -1$

(2) $1/2, -1, 0$

(3) $-1/2, 1, 0$

(4) $-1/2, -1, 0$

81 For the C program given below, what will be the output?

```
#include <stdio.h>
main ()
{
char ar[] = "computer science"
print f("\n%c", *(ar++));
return (0);
}
```

(1) c

(2) 0

(3) Compile-time error message

(4) Run-time error message

82 A speaks truth 3 times out of 4 and B speaks 7 times out of 10. The both assert that a white ball has been drawn from a bag containing 6 different color balls. Find the probability of the truth of the assertion

(1) $21/40$

(2) $35/36$

(3) $39/40$

(4) None of these

- 83 The roots of the equation $6x^{3/4} = 7x^{1/4} - 2x^{-1/4}$ are
- (1) 4/9 and 1/9
 - (2) 9/4 and 1/4
 - (3) 4/9 and 1/4
 - (4) None of these
- 84 The three sides of a trapezium are equal and each being 6cm long. The maximum area of a trapezium is
- (1) $27\sqrt{3} \text{ cm}^2$
 - (2) $36\sqrt{3} \text{ cm}^2$
 - (3) $72\sqrt{3} \text{ cm}^2$
 - (4) None of these
- 85 For a machine with 48-bit virtual address, 32-bit physical address and page size 8 K, how many entries will be there in an inverted page table?
- (1) 2^{32}
 - (2) 2^{48}
 - (3) 2^{13}
 - (4) 2^{19}
- 86 If $\sin(x + 3\alpha) = 3 \sin(\alpha - x)$, then
- (1) $\tan x = \tan \alpha$
 - (2) $\tan x = \tan^2 \alpha$
 - (3) $\tan x = \tan^3 \alpha$
 - (4) $\tan x = 3 \tan \alpha$
- 87 The rule of inference stated as $a \rightarrow b, b \rightarrow c \mid -a \rightarrow c$ is known as
- (1) modus ponens
 - (2) modus tollens
 - (3) syllogism
 - (4) None of these
- 88 The solution of the differential equation $y(x^2 y + e^x)dx - e^x dy = 0$ is
- (1) $3xy^3 + e^x = cx$
 - (2) $xy^3 + 3e^x = cx$
 - (3) $3x^3 y^3 + e^x = cx$
 - (4) $x^3 y + 3e^x = cx$

89 The function f defined by $f(x) = x[1 + 1/3 \sin(\log x^2), x \neq 0, f(0) = 0$ ([] represents the greatest integer function) is

- (1) continuous and differentiable at origin
- (2) not continuous but differentiable
- (3) continuous but not differentiable
- (4) not continuous and not differentiable

90 If f is twice differentiable function such that $f''(x) = -f(x)$, $f'(x) = g(x)$ and $h(x) = [f(x)]^2 + [g(x)]^2$, also if $h(5) = 11$, then $h(10)$ is equal to

- (1) 22
- (2) 121
- (3) 16
- (4) None of these

91 $\tan A + 2 \tan 2A + 4 \tan 4A + 8 \cot 8A$ is equal to

- (1) $\tan 2A$
- (2) $\cot A$
- (3) $\sin 3A$
- (4) None of these

92 The isolated mapped IO scheme resulted in introduction of one more pin M/\overline{IO} . It helps in

- (1) isolating memory with the IO devices
- (2) increasing the number of addressable memory locations
- (3) increasing the number of IO devices
- (4) All of the above

93 In four throws with a pair of dice, what is the chance of throwing doublets at least twice?

- (1) 1/144
- (2) 25/144
- (3) 19/144
- (4) 26/144

94 If $x = \cos \theta, y = \sin^3 \theta$, then which of the following equations is true?

- (1) $\frac{d^2 y}{dx^2} + y \frac{dy}{dx} = \sin^2 \theta (5 \cos^2 \theta - 1)$
- (2) $y \frac{d^2 y}{dx^2} + \frac{dy}{dx} = 3 \sin^2 \theta (5 \cos^2 \theta - 1)$

$$(3) y \frac{d^2 y}{dx^2} + \left(\frac{dy}{dx} \right)^2 = 3 \sin^2 \theta (5 \cos^2 \theta - 1)$$

(4) None of these

95 If a file of size $n = 1000$ takes, on an average, 3ms for searching an item using binary search algorithm, then approximately, how much time, on an average, would it take to search an item in a file on size $n = 1000000000$?

(1) 9000000 ms

(2) 9 ms

(3) 3000000 ms

(4) None of these

96 A disk of 30 MByte capacity uses block size of 512 bytes and 4 block/clusters. How many entries are required in FAT (File Allocation Table)?

(1) 30 K

(2) 512 K

(3) 15 K

(4) 60 K

97 The value of $\int \frac{x}{\sec x + 1} dx$ is

$$(1) \frac{x}{2} - \frac{x^2}{2} \tan\left(\frac{x}{2}\right) + 2 \log(\sec x)$$

$$(2) \frac{x^2}{2} - x \tan\left(\frac{x}{2}\right) + 2 \log(\sec x / 2)$$

$$(3) \frac{x^2}{2} - \frac{x^2}{2} \tan\left(\frac{x}{2}\right) + 2 \log(\sec x)$$

(4) None of these

98 An entity and its subclasses and their subclasses and so on are called as

(1) type hierarchy

(2) range hierarchy

(3) inheritance

(4) None of these

99 The value of $\int \frac{x - \sin x}{1 - \cos x} dx$ is

$$(1) -\frac{x^2}{2} \cot\left(\frac{x}{2}\right)$$

$$(2) \frac{x^2}{2} \cot\left(\frac{x}{2}\right)$$

$$(3) -\cot\left(\frac{x}{2}\right)$$

$$(4) x \cot\left(\frac{x}{2}\right)$$

100 The limit of $A^x \sin\left(\frac{B}{A^x}\right)$ where $x \rightarrow \infty$ and $0 < A < 1$ is

(1) B

(2) 1

(3) A

(4) 0

101 The solution of the equation $\frac{dy}{dx} = \frac{3x - 4y - 2}{3x - 4y - 3}$ is

(1) $(x - y)^2 + C = \log(3x - 4y + 1)$

(2) $x - y + C = \log(3x - 4y + 4)$

(3) $x - y + C = \log(3x - 4y - 3)$

(4) $x - y + C = \log(3x - 4y + 1)$

102 Which of the following C statements is not correct?

(1) $a = a + 1$

(2) $a+ = 1$

(3) $a++$

(4) $a = +1$

103 A particle is moving eastwards with velocity 5 m/s. In 10 seconds the velocity changes to 5 m/s northwards. The average acceleration in this time is

(1) zero

(2) $\frac{1}{\sqrt{2}} m/s^2$ towards North-West

(3) $\frac{1}{\sqrt{2}} m/s^2$ towards North-East

(4) $\frac{1}{2} m/s^2$ towards North

104 Which integrity constraint guarantees that every primary key attribute is non-null?

- (1) Domain integrity
- (2) Key integrity
- (3) Entity integrity
- (4) Referential integrity

105 The area of the region bounded by the curves $x^2 + y^2 = a^2$ and $x + y = a$ in the first quadrant is given by

- (1) $\int_0^a \int_{a-x}^{\sqrt{a^2-x^2}} dx dy$
- (2) $\int_0^a \int_{a-x}^{\sqrt{a^2-x^2}} dy dx$
- (3) $\int_{a-x}^{\sqrt{a^2-x^2}} \int_0^a dx dy$
- (4) None of these

106 Which of the following rules that every piece of data in a relational database, can be accessed by using a combination of a table name, a primary key value that identifies the row and the column name, which identifies the cell?

- (1) Information rule
- (2) Non-subversion rule
- (3) Integrity rule
- (4) Guaranteed access rule

107 If $A = \begin{bmatrix} 5 & 0 & -2 \\ 0 & 1 & 0 \\ -4 & 0 & -1 \end{bmatrix}$ and I be 3×3 unit matrix, the rank of $I - A$ is

- (1) 0
- (2) 1
- (3) 2
- (4) 3

108 The program that combines the output of compiler with various library functions to produce an executable image is called

- (1) loader
- (2) linker
- (3) assembler
- (4) debugger

109 Which of the following is false?

- (1) If A is a square matrix, then $\text{Adj } A' = (\text{Adj } A)'$

- (2) If I is the identity matrix of order n , then $\text{Adj } I = I$
 (3) $(A^*)^{-1} = (A^{-1})^*$
 (4) If A and B are invertible, $AB = BA$

110 If ABC is not a right triangle, then the value of

$$\Delta = \begin{vmatrix} \tan A & 1 & 1 \\ 1 & \tan B & 1 \\ 1 & 1 & \tan C \end{vmatrix} \text{ is}$$

- (1) -1
 (2) 2
 (3) 3
 (4) 0

111 If the expression $((2 + 3) \times 4 + 5 \times (6 + 7) \times 8) + 9$ is evaluated with \times having precedence over $+$, then the value obtained in prefix notation for the expression will be

- (1) $+ \times ++234 \times \times 5++6789$
 (2) $\times ++234 \times \times 5++6789$
 (3) $+ \times + \times 234 ++ 5 \times 6789$
 (4) None of these

112 If $e^{ix} = \cos x + i \sin x$ and $x + iy = \begin{vmatrix} 1 & e^{\pi i/4} & e^{\pi i/3} \\ e^{-\pi i/4} & 1 & e^{2\pi i/3} \\ e^{-\pi i/3} & e^{-2\pi i/3} & e^{-2\pi i} \end{vmatrix}$ then

- (1) $x = -1, y = \sqrt{2}$
 (2) $x = 1, y = -\sqrt{2}$
 (3) $x = -\sqrt{2}, y = \sqrt{2}$
 (4) None of these

113 The determinant $\begin{vmatrix} 1 & 1+i & i \\ 1+i & i & 1 \\ i & 1 & 1+i \end{vmatrix}$ equals

- (1) $7 + 4i$
 (2) $2 - 2i$
 (3) $-7 - 4i$
 (4) $-2 + 2i$

114 Given an n -bit number, we can represent two's complement numbers in the range

- (1) 0 to 2^{n-1}
- (2) 0 to $2^{n-1} - 1$
- (3) -2^{n-1} to 2^{n-1}
- (4) -2^{n-1} to $2^{n-1} - 1$

115 The solution of $y^5 x + y - x \frac{dy}{dx} = 0$ is

- (1) $x^4 / 4 + 1/5(x/y)^5 = C$
- (2) $x^5 / 5 + 1/4(x/y)^4 = C$
- (3) $(x/y)^5 / x^4 / 4 = C$
- (4) $(xy)^4 + x^5 / 5 = C$

116 Which of the following sub-query is resolved in the top to bottom fashion?

- (1) Nested
- (2) Parallel
- (3) Correlated
- (4) None of these

117 The number of irrational solutions of the equation

$$\sqrt{x^2 + \sqrt{x^2 + 11}} + \sqrt{x^2 - \sqrt{x^2 + 11}} = 4 \text{ is}$$

- (1) 0
- (2) 2
- (3) 4
- (4) indefinite

118 The term independent of x in the expansion of $(2x^2 - 1/x)^{12}$ is

- (1) 7910
- (2) 7920
- (3) 7930
- (4) 7900

119 A and B throw with one die for a stake of Rs 11 which is to be won by the player who first throws 6. If A has the first throw, what is the expectation of his winning the stake?

- (1) 5/11
- (2) 15/26
- (3) 6/11
- (4) 16/26

120 A river is flowing from West to East at a speed of 5 metres per minute. A man on the South bank of the river, capable of swimming at 10 metres per minute in still water, wants to swim across the river in the shortest time. He should swim in a direction

- (1) towards North
- (2) 30° East of North
- (3) 30° West of North
- (4) 60° East of North

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