

JNU MCA Original Paper - 2020

1. If $G = \{1, -1, i, -i\}$ is a multiplicative group, then order of $(-i)$ is :

- (A) 1
- (B) 2
- (C) 3
- (D) 4
- (E) None of these

Choose the most appropriate answer from the options given below:

- (a) A Only
- (b) B, C only
- (c) D only
- (d) E Only

2. If $f(n) = \int_0^{\pi/4} \tan^n x dx$, then value of $f(3) + f(1)$ is equal to

- (a) 1
- (b) $\frac{1}{2}$
- (c) 0
- (d) $\frac{3}{2}$

3. Solve the inequality $\frac{(x-3)^2(x+7)}{(4-x)} < 0$.

Choose the **correct** answer from below.

- (a) $x < -7$ or $x > 4$
- (b) $x > -7$ or $x < 4$
- (c) $x < -3$ or $x > 4$
- (d) $x > -3$ or $x < 4$

4. If $f(x) = ce^{-(x^2-6x+9)/32}$, $-\infty < x < \infty$, represents a normal distribution, find the value of c , the mean μ and the variance σ^2 of the distribution.

- (a) $\mu = 3, \sigma^2 = 16, c = \frac{1}{4\sqrt{2\pi}}$
- (b) $\mu = 4, \sigma^2 = 16, c = \frac{1}{4\sqrt{2\pi}}$

- (c) $\mu = 3, \sigma^2 = 15, c = \frac{1}{4\sqrt{2\pi}}$
- (d) $\mu = 3, \sigma^2 = 16, c = \frac{1}{2\sqrt{2\pi}}$

5. Which kind of multiplexing scheme is adopted by Von-Newmann Architecture especially for program and data fetching purposes ?

- (a) Time Division Multiplexing
- (b) Frequency Division Multiplexing
- (c) Statistical Time Division Multiplexing
- (d) Code Division Multiplexing

6. Find the eigenvalues of the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

Choose the **correct** answer from below.

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

7. Consider the following 'C' declaration, `int *A [10], B[10][10];`

Of the following expression, which will not give compile-time errors if used as left hand sides of assignment statements ?

- A. `A[2]`
- B. `A[2][3]`
- C. `B[1]`
- D. `B[2][3]`

Choose the **correct** answer from the options given below.

- (A) A, B and D only
- (B) B, C and D only
- (C) C and D only
- (D) D only

8. Given that

X	1	2	3	4	5
U	2	5	10	20	30

- (a) $\Delta = \nabla E^{-1}$
 (b) $\Delta = E + I$
 (c) $\Delta^2 u_4 = u_4 - 2u_3 - u_2$
 (d) $\nabla^2 u_4 = 5$

9. Consider the following 'C' declaration.

Struct node {

int i;

float j;

};

struct node *s[10];

Of the following, how to define s ?

- (a) An array, each element of which is a pointer to a structure of type node.
 (b) A structure of 2 fields, each field being a pointer to an array of 10 elements.
 (c) A structure of 3 fields; an integer, a float and an array of 10 elements.
 (d) An array, each element of which is a structure of type node.

10. The value of the determinant

$$\begin{vmatrix} \operatorname{cosec}^2 \theta & \cot^2 \theta & 1 \\ \cot^2 \theta & \operatorname{cosec}^2 \theta & -1 \\ 42 & 40 & 2 \end{vmatrix} \text{ is:}$$

- (a) 0 (b) 1
 (c) -1 (d) None of these

11. If X is a Poisson variate such that $P(X = 2) = 9P(X = 4) + 90P(X = 6)$, then the mean of the distributions :

- (a) 1 (b) 2
 (c) 3 (d) 4

12. The Boolean expression $AB + A\bar{B} + \bar{A}C + AC$ is independent of the Boolean variable

- (a) A (b) B
 (c) C (d) None of these

13. Assuming that only X and Y logic inputs are available and their complements \bar{X} and \bar{Y} are not available, what is the minimum number of two input NAND gates required to implement $X \oplus Y$?

- (a) 2 (b) 3

- (c) 4 (d) 5

14. **Statement I:**

The equation of the parabola, whose focus is the point (2,3) and directrix is the line $x - 4y + 3 = 0$, is

$$16x^2 + y^2 + 8xy - 74x - 78y + 212 = 0$$

Statement II:

The eccentricity of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ which passes through the points (3,0) and $(3\sqrt{2}, 2)$ is $\frac{\sqrt{13}}{3}$.

In the light of the above statements, choose the correct answer from the options given below.

- (a) Both Statement I and Statement II are true.
 (b) Both Statement I and Statement II are false.
 (c) Statement I is correct, but Statement II is false.
 (d) Statement I is incorrect, but Statement II is true.

15. The equation of the circle having centre (1, -2) and passing through the point of intersection of the lines $3x + y = 14$ and $2x + 5y = 18$ is :

- (a) $x^2 + y^2 - 2x + 4y - 20 = 0$
 (b) $x^2 + y^2 - 2x - 4y - 20 = 0$
 (c) $x^2 + y^2 + 2x - 4y - 20 = 0$
 (d) $x^2 + y^2 + 2x + 4y - 20 = 0$

16. If three unbiased coins are tossed, find the probability of getting

- (i) at least two tails, and
 (ii) at most two tails.

- (a) $\frac{1}{2}, \frac{3}{8}$ (b) $\frac{1}{2}, \frac{5}{8}$
 (c) $\frac{1}{2}, \frac{7}{8}$ (d) $\frac{1}{2}, \frac{1}{8}$

17. The Newton divided difference polynomial which interpolate the data

$$f(0) = 1, f(1) = 3, f(3) = 55 \text{ is :}$$

- (a) $8x^2 + 6x + 1$
 (b) $8x^2 - 6x + 1$
 (c) $8x^2 - 6x - 1$
 (d) $8x^2 + 6x - 1$

18. Consider the following 'C' declaration.

```
struct {  
    short s[5];  
    union {  
        float y;  
        long z;  
    } n;  
} t;
```

Assume that objects of type short, float and long occupy 2 bytes, 4 bytes and 8 bytes respectively. What will be the memory requirement for variable, ignoring alignment consideration ?

- (a) 22 Bytes (b) 14 Bytes
(c) 18 Bytes (d) 10 Bytes

19. If $x^6 - y^6 = 0$, what is the value of $x^3 - y^3 = 0$?

- (I) x is positive
(II) y is greater than 1
(a) (I) only
(b) (II) only
(c) (I) and (II) both are necessary
(d) Neither (I) or (II)

20. A, B and C can paint a wall in 22 days. If A takes 99 days and B takes 36 days to paint the wall, how many days will C take to paint it alone ?

- (a) 66 (b) 72
(c) 132 (d) None of these

21. Given below are two statements.

Statement I:

The order of every element of a finite group is infinite.

Statement II:

If there is no positive integer n such that $a^n = e$, then the order of a denoted by O(a), is infinite or zero.

In the light of the above statements, choose the **most appropriate** answer from the options given below.

- (a) Both **Statement I** and **Statement II** are

correct

(b) Both **Statement I** and **Statement II** are incorrect

(c) **Statement I** is correct, but **Statement II** is incorrect

(d) **Statement I** is incorrect but **Statement II** is correct

22. **Statement I:**

Circle on which the co-ordinates of any point are $(2 + 4 \cos \theta, -1 + 4 \sin \theta)$, where θ is parameter, is given by $(x - 2)^2 + (y + 1)^2 = 16$.

Statement II:

The equation of the circle which passes through the point (4, 5) and has its centre at (2, 2) is $(x - 2)^2 + (y - 2)^2 = 11$.

In the light of the above statements, choose the correct answer from the options given below.

- (a) Both **Statement I** and **Statement II** are true.
(b) Both **Statement I** and **Statement II** are false.
(c) **Statement I** is correct, but **Statement II** is false.
(d) **Statement I** is incorrect, but **Statement II** is true.

23. If G be a group such that $a^2 = e, \forall a \in G$, then G is :

- (a) abelian
(b) non-abelian group
(c) ring
(d) Field

24. The value of $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dy dx$ by changing the order of integration is:

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

25. Consider a graph where

$$V(G) = \{P, Q, R, S\}$$

and $E(G) = \{(P, Q), (Q, R), (R, S), (S, Q)\}$

The degree of each vertices P, Q, R, S respectively in G are as follows :

- (a) 1, 1, 1, 1
- (b) 1, 3, 2, 2
- (c) 1, 2, 2, 3
- (d) 1, 2, 3, 2

26. Let G be the group of order 30. Let A and B be normal subgroups of order 2 and 5, respectively.

Then, the order of the group $\frac{G}{AB}$ is :

- (a) 10
- (b) 3
- (c) 2
- (d) 5

27. The height of binary tree is the maximum number of edges in any root to leaf path. The maximum number of nodes in a binary tree of height h is :

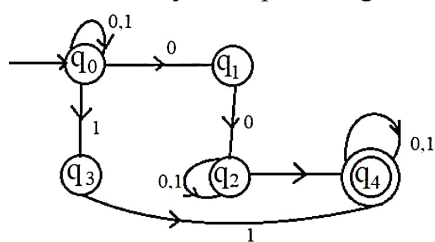
- (a) 2^h
- (b) $2^{h-1} - 1$
- (c) $2^{h+1} - 1$
- (d) 2^{h+1}

28. Find the value of $f\left(\frac{1}{\sqrt{3}}\right)$ when

$$\int_{\sin x}^1 t^2 f(t) dt = 1 - \sin x, \forall x \in \left[0, \frac{\pi}{2}\right].$$

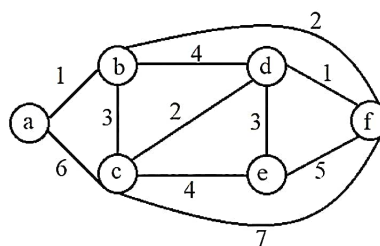
- (a) 3
- (b) 2
- (c) 4
- (d) 1

29. Consider the given NDFFA and determine the states reached by the input string 001.



- (a) $\{q_0, q_3, q_4\}$
- (b) $\{q_0, q_1, q_2\}$
- (c) $\{q_1, q_2, q_3\}$
- (d) $\{q_1, q_2, q_4\}$

30. Consider the following graph



- (a) $(a - b), (d - f), (b - f), (d - c), (d - e)$
- (b) $(a - b), (d - f), (d - c), (b - f), (d - e)$
- (c) $(d - f), (a - b), (d - c), (b - f), (d - e)$
- (d) $(d - f), (a - b), (b - f), (d - e), (d - c)$

31. Suppose a coin, weight so that $P(H) = \frac{2}{3}$ and

$P(T) = \frac{1}{3}$, is tossed. If head appears, then a number is selected at random from $\{1,2,3,4,5,6,7,8,9\}$; if tail appears, then a number is selected from $\{1,2,3,4,5\}$. Then the probability that an even number 'Ev' appears.

- (a) $\frac{58}{135}$
- (b) $\frac{68}{135}$
- (c) $\frac{77}{135}$
- (d) $\frac{87}{135}$

32. Find the value of integral $\int_{-\pi}^{\pi} \frac{\cos^2 x}{1+a^x} dx$, where $a > 0$

- (a) $\frac{\pi}{2}$
- (b) $\frac{\pi}{4}$
- (c) $\frac{\pi}{3}$
- (d) $\frac{\pi}{6}$

33. The result of evaluating the postfix expression

$$5\ 4\ 6\ +\ * \ 4\ 9\ 3\ 1\ +\ *$$

- (a) 600
- (b) 350
- (c) 650
- (d) 588

34. The minimum number of NAND gates required to implement Boolean Function:

$$A + A\bar{B} + A\bar{B}C$$

- (a) Zero
- (b) 1
- (c) 4
- (d) 7

35. Given below are two Statements.

Statement I:

The interval of values of x for which

$f(x) = 3x^2 - 6x + 2$ is decreasing is $(-\infty, \infty)$.

Statement II:

The interval of values of x for which $g(x) = 4x^3 + 7x - 2$ is increasing is $(-\infty, \infty)$. In the light of the above statements, choose the correct answer from the options given below.

- (a) Both **Statement I** and **Statement II** are true
- (b) Both **Statement I** and **Statement II** are false
- (c) **Statement I** is correct, but **Statement II** is false.
- (d) **Statement I** is incorrect, but **Statement II** is true

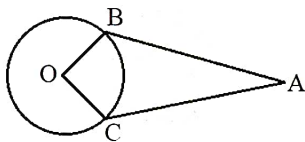
36. Given the following frequency distribution of income of employees.

Income ₹/month	No. of employees
0 - 250	12
250 - 500	20
500 - 750	23
750 - 1,000	15
1,000 - 1,250	10
1,250 - 1,500	20

The median income of employees is :

- (a) 625.00
- (b) 760.25
- (c) 695.65
- (d) 800.15

37. Find the area of the quadrilateral ABOC, given that the diameter of the circle is 20cm and AB=18cm.



- (a) 185
- (b) 180
- (c) 179
- (d) 178

38. If the MAX_SIZE is the size of the array used in the implementation of circular queue, assume array index start with 0, front points towards the first element in the queue, and rear points towards the last element in the queue. Which of the

following condition specify that circular queue is Full ?

- (a) Front = rear = - 1
- (b) Front = (rear + 1)%MAX_SIZE
- (c) Rear = front + 1
- (d) Rear = (front + 1)%MAX_SIZE

39. If $2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\hat{i} + 2\hat{j} + 3\hat{k}$ are two different sides of rhombus, then the length of the diagonals are

- (a) $7, \sqrt{69}$
- (b) $6, \sqrt{59}$
- (c) $5, \sqrt{65}$
- (d) $8, \sqrt{45}$

40. If $x \cos \theta - y \sin \theta = \sqrt{x^2 + y^2}$ and $\frac{\cos^2 \theta}{a^2} + \frac{\sin^2 \theta}{b^2} = \frac{1}{x^2 + y^2}$, then the correct relation is

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

41. Find the domain and range of the function $f: R \rightarrow R$, $f(x) = \frac{3x-1}{x-3}$.

- A. $\{x \in R: x \neq 3\}$
- B. $\{x \in R: x \neq \frac{1}{3}\}$
- C. $\{y \in R: y \neq 3\}$
- D. $\{y \in R: y \neq \frac{1}{3}\}$

- (a) A and C only
- (b) A and D only
- (c) B and C only
- (d) B and D only

42. **Statement I:**

'C' Programming language allows the recursion of a function.

Statement II:

Recursion of main() function in 'C' language is possible.

In the light of the above statements, choose the correct answer from the options given below.

- (a) Both Statement I and Statement II are true
- (b) Both Statement I and Statement II are false
- (c) Statement I is correct, but Statement II is false

(d) Statement I is incorrect, but Statement II is true

43. What is the Excess-3 code for $(45)_{10}$

- (a) 0111 0101 (b) 0111 1000
(c) 0111 1010 (d) 0111 1001

44. The equation of the ellipse whose centre is at the origin and the x-axis, the major axis, passing through the points $(-3, 1)$ and $(2, -2)$ is given by :

- (a) $5x^2 + 3y^2 = 32$
(b) $3x^2 + 5y^2 = 32$
(c) $5x^2 - 3y^2 = 32$
(d) $3x^2 + 5y^2 = -32$

45. If the points $(-1, -1, 2)$, $(2, m, 5)$ and $(3, 11, 6)$ are collinear, then the value of m is :

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

46. The functional capacity for SSI devices is :

- (a) 1 to 11 gates
(b) 12 to 99 gates
(c) 100 to 10000 gates
(d) More than 10000 gates

47. **Statements :**

All the fools are genius.
No genius is a cricketer.

Conclusions :

- (A) All the geniuses are fools.
(B) Some fools are not cricketers.
(C) No fool is a cricketer.
(D) All cricketers are fools.

Choose the correct answer from the options given below :

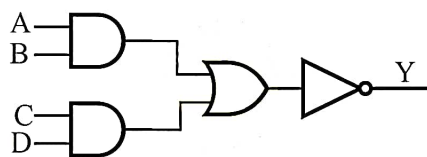
- (a) (C) only
(b) (B), (C), (D) only
(c) (B) and (C) only
(d) (A) and (D) only

48. The moment generating function of the random variable X, whose moments are $\mu_r' = r! 2^r$, is :

- (a) $(1 - 2t)^{-1}$ (b) $(1 - 2t)^{-2}$

- (c) $(1 - 2t)^{-3}$ (d) $\frac{1}{2t}$

49. In the figure below, what is the Boolean equation?



- (a) $Y = \overline{AB} + \overline{CD}$
(b) $Y = \overline{AB + CD}$
(c) $Y = \overline{(A + B) + (C + D)}$
(d) None of the above

50. **Statements :**

All trains are not planes.
All planes are cars.

Conclusions :

- (A) Some cars are not trains.
(B) Some trains are cars.

Choose the **correct** answer from the options given below.

- (a) (A) only
(b) (B) only
(c) (A) and (B) only
(d) (A) or (B) only

51. The base of the triangle is increased by 40%.

What can be the maximum percentage increase in the length of the height so that the increase in area is restricted to a maximum of 60% ?

- (a) 14.95% (b) 14.98%
(c) 14.28% (d) 14.45%

52. What will be the maximum number of centre in a Tree ?

- (a) One (b) Two
(c) Three (d) Infinite

53. YSDG : GDSY :: _____ : IOTU.

- (a) UTOI (b) VUPJ
(c) TVSJ (d) STIO

54. Choose the 'ODD' man out : UW, DF, GI, LP.

- (a) UW (b) DF
(c) GI (d) LP

55. If ${}^n C_{r-1} = 36$, ${}^n C_r = 84$ and ${}^n C_{r+1} = 136$, what will be the value of n ?

- (a) 3 (b) 5
(c) 7 (d) 9

56. What will be the output of following 'C' code ?

```
main()
{
    int i = 1, j = 2;
    switch (i)
    {
        case i : printf ("GOOD");
                break;
        case j : printf ("BYE");
                break;
    }
}
```

- (a) GOOD (b) GOODBYE
(c) Compilation Error (d) Runtime Error

57. Let $f(x) = \frac{1}{1+\sqrt{x}}$ and $g(x) = x + 7$. Then, the value of x at which $(f^{-1} \circ g^{-1})(x) = 9$ is:

- (a) $x = \frac{29}{4}$ (b) $x = \frac{13}{2}$
(c) $x = \frac{19}{2}$ (d) $x = \frac{23}{4}$

Choose the correct answer from the options given below.

- (a) A and B Only
(b) A and C only
(c) B and D only
(d) C and D only

58. Find the odd man out.

3, 5, 7, 12, 17, 19

- (a) 19 (b) 17
(c) 7 (d) 12

59. The third divided difference of $\frac{1}{x}$ based on the points x_0, x_1, x_2, x_3 is :

- (a) $-\frac{1}{x_0 x_1 x_2 x_3}$ (b) $\frac{1}{x_0 x_1 x_2 x_3}$
(c) $-\frac{1}{x_0 x_1 x_2}$ (d) $\frac{1}{x_0 x_1 x_2}$

60. If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 3 \\ 0 & 1 & 2 \end{bmatrix}$, then

- (a) $A^3 - 3A^2 + 6A - 4I = 0$
(b) $2A^3 - 2A^2 + 4I = 0$
(c) $A^3 - A^2 + A + I = 0$
(d) None of these

61. If $\vec{a} = 2\hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ and unit vector \vec{c} are coplanar vectors such that \vec{c} and \vec{a} are perpendicular, then \vec{c} is :

- (a) $\frac{-\hat{j} + \hat{k}}{\sqrt{2}}$ (b) $\frac{-\hat{j} - \hat{k}}{\sqrt{3}}$
(c) $\frac{\hat{i} - 2\hat{j}}{\sqrt{5}}$ (d) $\frac{\hat{i} - \hat{j} - \hat{k}}{\sqrt{3}}$

62. The equation of the straight line passing through (1, 2) and perpendicular to the line $x + y + 7 = 0$ is :

- (a) $x - y = -1$
(b) $x + y = 1$
(c) $x + 2y = 1$
(d) $x - 3y = 1$

63. Find the biggest fraction among the following :

- $\frac{5}{7}, \frac{7}{9}, \frac{9}{11}, \frac{11}{13}, \frac{13}{15}$
(a) $\frac{5}{7}$ (b) $\frac{9}{11}$ (c) $\frac{11}{13}$ (d) $\frac{13}{15}$

64. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$, then the value of $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$ is

- (a) 1 (b) -3
(c) $-\frac{3}{2}$ (d) None of these

65. A cache has 64 blocks with block size of 16 bytes. A block in main memory having address 1200 has to be mapped into cache using direct mapping method. What would be the corresponding block number in cache ?

- (a) 11 (b) 12
(c) 13 (d) None of the above

66. The perimeter of a rectangular field is 480 metres

and the ratio between the length and the breadth is 5 : 3. The area is :

- (a) 1350 sq.m. (b) 1550 sq.m.
(c) 13500 sq.m. (d) 15500 sq.m.

67. The position vector of the point which divides the join of points with position vectors $\vec{a} + \vec{b}$ and $2\vec{a} - \vec{b}$ in the ration 1:2 is:

- (a) $\frac{3\vec{a}+2\vec{b}}{3}$ (b) \vec{a}
(c) $\frac{5\vec{a}-\vec{b}}{3}$ (d) $\frac{4\vec{a}+\vec{b}}{3}$

68. The price of 357 mangoes is ₹ 1517.25. What will be the approximate price of 49 dozens of such mangoes ?

- (a) 3000 (b) 3500
(c) 4000 (d) 2500

69. MK : 1311 :: HJ : ?

- (a) 911 (b) 1011
(c) 810 (d) 710

70. Three wheels can complete respectively 60, 36, 24 revolutions per minute. There is a white spot on each wheel that touches the ground at time zero. After how much time, all these spots will simultaneously touch the ground again ?

- (a) 5 (b) 10
(c) 7 (d) 6

71. For what value of k, the function

$$f(x) = \begin{cases} \frac{\sin^{-1}(xy-2)}{\tan^{-1}(3xy-6)} & (x, y) \neq (1,2) \\ k & (x, y) = (1,2) \end{cases} \text{ is}$$

continuous ?

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

72. Given below are two Statements.

Statement I:

Let n be a positive integer greater than 3. Then, $(n^3 - 8)$ can never be a prime number.

Statement II:

Let n be a positive integer. Then, $(2n + 1)^2 - (2n - 1)^2$ will be always divisible by 8.

In the light of the above statements, choose the **most appropriate** answer from the options given below.

- (a) Both Statement I and Statement II are correct
(b) Both Statement I and Statement II are incorrect
(c) Statement I is correct, but Statement II is incorrect.
(d) Statement I is incorrect, but Statement II is correct.

73. Which of the following is always odd ?

- (a) Sum of two odd numbers
(b) Difference of two odd numbers
(c) Product of two odd numbers
(d) None of these

74. Find the value of y in $y^2 - 10y + 24 = 0$.

- (a) 6 or 4 (b) 4 or 3
(c) 3 or 2 (d) 1 or 5

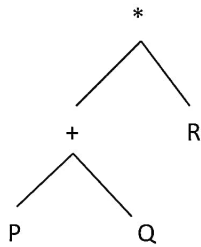
75. A man said to a woman, 'I am your husband's father-in-law's wife's only son'. How can the woman be related to the man ?

- (a) Daughter
(b) Aunt
(c) Daughter-in-law
(d) Sister

76. If ${}^{2n}C_3 : {}^nC_2 = 11 : 1$, what is the value of n ?

- (a) 4 (b) 5
(c) 6 (d) None of the above

77. Which of the following is represented by parse tree?



- (a) $P * R + Q$ (b) $P + Q * R$
 (c) $P + * QR$ (d) $(P + Q) * R$

78. Let a quadratic function be defined on $[a, b]$ by $f(x) = \alpha x^2 + \beta x + \gamma, \alpha \neq 0$. Then, the real number 'c' guaranteed by Lagrange's mean value theorem is equal to :

- (a) $\frac{a+b}{2}$ (b) \sqrt{ab}
 (c) $\frac{2ab}{a+b}$ (d) $\frac{a}{b} + \frac{b}{a}$

79. What is the volume of a cube ?

Statement I:

The area of each face of the cube is 64 square metres.

Statement II:

The length of one side of the cube is 8 metres.

- (a) Statement (I) alone is sufficient to answer the question.
 (b) Statement (II) alone is sufficient to answer the question.
 (c) Statement (I) or Statement (II) alone is sufficient.
 (d) Statement (I) and (II) together are necessary to answer the question.

80. If $(G, *)$ is a cyclic group of order 73, then the number of generator of G is equal to :

- (a) 89 (b) 23
 (c) 72 (d) 17

81. If $\tan \alpha = \frac{m}{m+1}$ and $\tan \beta = \frac{1}{2m+1}$, then $\alpha + \beta =$

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

82. Given a complete graph of 'n' vertices, how many Hamiltonian circuits are possible ?

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

83. Let G be a group with 8 elements. Let H be a subgroup of G . It is given that the size of H is at least 3. Then, the size of H will be :

- (a) 8 (b) 2
 (c) 3 (d) 4

84. Solve the inequality $\frac{2x+7}{|x|+1} < 3$. Choose the correct answer from below.

- (a) $x \in (-\infty, 4) \cup (7, \infty)$
 (b) $x \in (-\infty, -\frac{4}{5}) \cup (1, \infty)$
 (c) $x \in (-\infty, -\frac{4}{5}) \cup (4, \infty)$
 (d) $x \in (-\infty, 1) \cup (4, \infty)$

85. Consider these 'C' code to swap two integers.

```
void swap (int *x, *y)
{
    *x = *x - *y;
    *y = *x + *y;
    *x = *y - *x;
}
```

- A. Will generate a compilation error.
 B. May generate a segmentation fault at runtime depending upon the arguments passed.
 C. Correctly implements the swap procedure for all input pointers referring to integers stored in memory locations accessible to processes.
 D. Implements the swap procedure correctly for some but not all valid input pointers.
 E. May add or subtract integers and pointers.

- (a) A only (b) B and C only
 (c) B and D only (d) B and E only

86. Let $X_k = (P_1 P_2 \dots P_k) + 1$, where P_1, P_2, \dots, P_k are the first k primes.

Consider the following :

- A. X_k is a prime number
- B. X_k is a composite number
- C. X_{k+1} is always an even number

Choose the correct answer from the options given below.

- (a) A only
- (b) B only
- (c) C only
- (d) A and C only

87. 4 Variable Boolean Function is given as :

$$F(A, B, C, D) = \Sigma(2, 3, 4, 5, 6, 7, 11, 14, 15)$$

Simplify the above function in POS (Product Of Sum) form by a 4 Variable map.

- (a) $(A + C)$
- (b) $(A + B)$
- (c) $(A' + C)(B + C)(A' + B + D)$
- (d) None of the above

88. If interrupt occurs during the execution of a program, then it :

- (a) follows the next instruction in the program
- (b) jumps to instruction in other registers
- (c) breaks the normal sequence of execution of instructions
- (d) stops executing the program

89. The value of $\cos \frac{\pi}{5} \cos \frac{2\pi}{5} \cos \frac{4\pi}{5} \cos \frac{8\pi}{5}$ is

- (a) $\frac{1}{16}$
- (b) 0
- (c) $\frac{4}{5}$
- (d) $-\frac{1}{16}$

90. If $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta} = 3$, then the value of $\sin^4 \theta - \cos^4 \theta$ is :

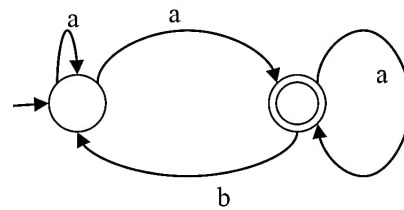
- (a) $\frac{1}{5}$
- (b) $\frac{3}{5}$
- (c) $\frac{2}{5}$
- (d) $\frac{4}{5}$

91. Find the next term in the series.

1, 2, 6, 15, 31, ?

- (a) 49
- (b) 52
- (c) 56
- (d) 57

92. What is the language by the following automation ?



- (a) $(a + b)^*(a + b)$
- (b) $(a + b)^* a$
- (c) $(a + b)^*$
- (d) $a^* b$

93. The value of $2 \sin^2 \theta + 3 \cos^2 \theta$ is:

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

94. Given below are two statements.

Statement I:

Let the function $f: R \rightarrow R$ be defined as

$$f(x) = \begin{cases} x & \text{if } x > 2 \\ 5x - 2 & \text{if } x \leq 2 \end{cases}, \text{ then } f(x) \text{ is onto}$$

Statement II:

Let $f: R \rightarrow R$ be a function defined as $f(x) = x^2$.

Then, $f(x)$ is one-one.

In the light of the above statements, choose the **correct** answer from the options given below.

- (a) Both Statement I and Statement II are true
- (b) Both Statement I and Statement II are false
- (c) Statement I is correct, but Statement II is false.
- (d) Statement I is incorrect, but Statement II is true.

95. An OR gate has 6 inputs. What is the only input word that produces a 0 output ?

- (a) 000000
- (b) 000111
- (c) 111000
- (d) 111111

96. What is/are true from the list given below ?

- A. Radix of any number system is the number of digits required to represent all numerical values in that system.
- B. Base of any number system is the number of digits required to represent all numerical values in that system.
- C. Radix is the exponent value of a number in any number system.

D. Base is the exponent value of a number in any number system.

Choose the correct answer from the options given below.

- (a) A and B only (b) A and D only
(c) B and C only (d) All A, B, C, D

97. Evaluate $\sum_{r=3}^{10} (5r + 2)$

Choose the **correct** answer.

- (a) 265 (b) 276
(c) 297 (d) None of these

98. If a variable X has the p.d.f $f(x) = \frac{1}{4}xe^{-x/2}, 0 < x < \infty$, then the distribution has mean and variance as:

- (a) mean = 2 and variance = 4
(b) mean = $\frac{1}{2}$ and variance = $\frac{1}{4}$
(c) mean = 4 and variance = 2
(d) mean = 4 and variance = 8

99. Let $2 \tan^2 x + \sec^2 x = 2, 0 \leq x \leq 2\pi$. Then, the possible solutions of x are:

- A. $\frac{\pi}{6}$
B. $\frac{5\pi}{6}$
C. $\frac{\pi}{3}$
D. $\frac{11\pi}{6}$
E. $\frac{\pi}{4}$

Choose the **correct** answer from the options given below.

- (a) A and B only (b) A, B and D only
(c) D and C only (d) D and E only

100. A point moves such that its distance from the point (4, 0) is half that of its distance from the line $x = 16$. The locus of the point is :

- (a) $3x^2 + 4y^2 = 192$
(b) $4x^2 + 3y^2 = 192$
(c) $x^2 + y^2 = 192$
(d) None of these