Q. No. 1 – 25 Carry One Mark Each

1. If x and y are two independent binomial variables defined as $B(4, \frac{1}{2})$ and $B(5, \frac{1}{2})$ respectively, then $P(x + y = 2)$ is_____

2. If $f : (0, \infty) \to R$ is defined as $f(x) = \log_7 x$, then which of the following is true?

   (A) $f^{-1}(x) = 7^x$ (B) $fof^{-1}(x) = x$

   (C) Both (A) & (B) (D) neither (A) nor (B)

3. *P*(*x*, *y*) means that for *x* and *y* the property *P* is true. Which of the following is not necessarily true?

   (A) $(\exists y \forall x P(x, y)) \to (\forall x \exists y P(x, y))$ (B) $(\exists x \exists y P(x, y)) \to (\exists y \exists x P(x, y))$

   (C) $(\forall x \exists y P(x, y)) \to (\exists y \forall x P(x, y))$ (D) $(\exists x \forall y\ P(x, y)) \to (\forall y \exists x P(x, y))$

4. Consider the following string of characters.

   5,4,3,2,5,6,7,8,9,3,2,4,1,2,3

   In a data link layer, character count method is used for framing, and then the above message can be divided into _____ frames.

5. Which of the following is/are necessary condition(s) for achieving the solution to the critical section problem?

   (A) Mutual exclusion (B) Progress

   (C) Bounded waiting (D) All of these

6. What would be the output of the following SQL query on EMP table?

```
SELECT *
FROM   EMP
 WHERE eno  > ANY ( SELECT   eno FROM EMP
                    WHERE        1 = 2 );
```

   (A) Error (B) All rows of EMP table

   (C) No Rows (D) None of these

7. Which of the following is true about the given schedule S?

(A) It is conflict serializable

(B) It is view serializable but not conflict serializable

(C) It is conflict serializable but not view serializable

(D) It is not serializable

SCHEDULE : S	
T1	**T2**
R(A)	
A= A + 100	
	R(A)
	A= A * 2
	W(A)
W(A)	
	R(B)
	B = B /2
	W(B)
R(B)	
B = B -100	
W(B)	

8. Which among the following schedules is an irrecoverable Schedule?

(A)

T1	**T2**
	R(A)
	W(A)
R(A)	
W(A)	
	Commit
Abort	

(B)

T1	**T2**
R(A)	
W(A)	
	R(A)
	W(A)
Abort	
	Abort

(C)

T1	**T2**
R(A)	
W(A)	
Abort	
	R(A)
	W(A)
	Commit

(D)

T1	**T2**
R(A)	
W(A)	
	R(A)
	W(A)
	Commit
Abort	

9. A LAN uses CSMA/CD protocol. The end to end propagation delay between two stations is 125μ sec. Find the contention period of LAN.

(A) 62.5μ sec (B) 125μ sec (C) 250μ sec (D) 187.5μ sec

10. Which of the following is used to reassemble splitted data packets in correct order?

(A) Check sum (B) Packet number

(C) Sequence number (D) ACK number

11. What will be the output of following C-code?

```
int main ()
{
    int a[3] = {67, 43, 23};
    int *p =a;
    printf("%d",++*p);
    printf("%d",*++p);
    printf("%d",*p++);
    return 0;
}
```

(A) 68 43 43 (B) 37 43 43 (C) 67 43 23 (D) 68 43 23

12. Consider following C-code. What is the value returned by fun (10)?

```
int fun (int n) {
Static int i=10;
    if (n>=200) return (n+i);
    else{
    n=n+i;
    i=n+i
    return fun(n);
    }
}
```

(A) 890 (B) 210 (C) 340 (D) none of these

13. A string is stored in a list. Which of the following implementation of list is most efficient to access the last element of string?

(A) Singly linked list
(B) Circular linked list
(C) Doubly linked list
(D) Circular doubly linked list

14. What is the estimated effort by the Watson-Felix method (in person-months) for a one million line military project?

(A) 3500 (B) 5000 (C) 2792 (D) 4200

15. Match the elements of list-II with the appropriate category of error given in list- I.

	LIST-I		LIST-II
(P)	Lexical	(1)	An arithmetic expression with unbalanced parenthesis
(Q)	Syntactic	(2)	An infinitely recursive call
(R)	Semantic	(3)	An operator applied to an incompatible operand
(S)	Logical	(4)	Input is not matching with any of the patterns defined

(A) $p-4, q-3, R-1, s-2$ (B) $p-2, q-1, R-3, s-4$

(C) $p-4, q-1, R-3, s-2$ (D) $p-2, q-3, R-1, s-4$

16. Choose the appropriate context free language L2 that ensures $L1 \cap L2$ is not context free where L1 = $\{a^n b^m c^m / m, n; > 0\}$.

(A) $L2 = \{a^n b^n c^n / n > 0\}$ (B) $L2 = \{a^n b^m c^p / n > m \text{ and } m > p\}$

(C) $L2 = \{a^n b^n c^{2m} / n > 0,\ m > 0\}$ (D) Both (B) & (C)

17. Which of the following strings can be generated by the production rules given below?

$S \to bS / aA$

$A \to d / cccA / ccA$

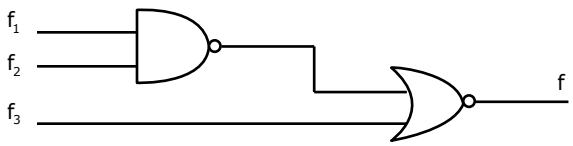
(A) bbbbccccccd (B) bbbdaccd (C) bbbbacccccd (D) babacccd

18. Translate the infix expression.

$((a+b)-(c*d))+e$ to prefix form. Then, identify the pair of symbols that appear consecutively in your prefix expression.

(A) $+c$ (B) $b*$ (C) $*-$ (D) $b+$

19. Consider the logic circuit shown in figure below:



The functions f_1, f_3 and f in canonical sum of products form are

$f_1(x, y, z) = \Sigma(0, 2, 3, 6, 7)$

$f_3(x, y, z) = \Sigma(0, 3, 4)$

$f(x, y, Z) = \Sigma(6, 7)$

The function f_2 can't be

(A) $\Sigma(6, 7, 4)$ (B) $\Sigma(6, 7, 5)$ (C) $\Sigma(6, 7, 1)$ (D) $\Sigma(6, 7, 2)$

20. A twisted ring counter is implemented using 4 D-flip flops. If each FF has 40nsec of delay, what is the maximum usable clock frequency which ensures that there are no timing violations?
(A) 30MHz (B) 15MHz (C) 25MHz (D) 50MHz

21. To handle the interrupt, processor jump to ISR. If ISR generates the same interrupt, this can result
(A) Program error (B) Stack Overflow
(C) Hardware error (D) none of these

22. Which of the following is displacement addressing mode?
(A) Relative (B) Indexed (C) Base (D) All of these

23. Inherited attributes are attributes at a node whose dependency is
(A) Restricted to siblings (B) restricted to parent
(C) both (A) & (B) (D) neither (A) nor (B)

24. An interrupt that can be temporarily ignored by computer is called
(A) Vectored Interrupt (B) Non maskable Interrupt
(C) Maskable Interrupt (D) none of these

25. Lagrange's mean value theorem cannot be applied to $f(x) = 2(x-1)^{2/3}$ in the interval [0, 2] because
(A) f(x) is not continuous in [0, 2] (B) f(x) is not differentiable in (0, 2)
(C) $f(0) \neq f(2)$ (D) Both (A) & (B)

Q. No. 26 – 51 Carry Two Marks Each

26. What will be the output of following C-code?

```
void fun( void * p);
static int i;
int main( ) {
        void * ptr;
        ptr = &i;
        fun(ptr);
        return 0;
}

void fun( void * p)
{
int * *q;
q = (int* *) & p;
printf("%d", + + * *q);
}
```

(A) Garbage value (B) 0
(C) 1 (D) compile-time error

27. A computer has 32-bit instruction and 12-bit address. Suppose there are 240 two-address instructions. How many 1-address instructions can be formulated?

(A) 2^{12} (B) 2^{14} (C) 2^{16} (D) 2^{18}

28. Consider the following processes which should be executed using SJF preemptive scheduling:

Process	Arrival time	Bunt time (m.s)
A	0	4
B	1	3
C	2	2
D	3	1

The average waiting time in ms is _____

29. Which of the following statement(s) is/are true?

S_1: FIFO algorithm yields the lowest page-fault rate compared to LRU algorithm in general.

S_2: Optimal algorithm yields the lowest page-fault rate compared to FIFO algorithm in general.

S_3: Optimal algorithm yields the lowest page-fault rate compared to LRU algorithm in general.

S_4: Both Optimal and LRU algorithms yields the same page-fault rate in general.

(A) S_1 and S_2 (B) S_2 and S_3 (C) S_1 and S_4 (D) S_1, S2 and S_3

30. Consider a relation R(A,B,C,D,E) with FD set $F = \{A \to BD, B \to E, C \to E\}$. Find the 2NF decomposition of the given relation.

(A) $R_1(A,B,E)$ $R_2(A,C,D)$ $R_3(B,D,E)$

(B) $R_1(A,B,D)$ $R_2(C,E)$ $R_3(B,E)$ $R_4(A,C,B)$

(C) $R_1(A,B,D)$ $R_2(C,E)$ $R_3(A,C)$

(D) Given relation is already in 2NF

31. If we construct a B-tree of order 3 by inserting the keys 5, 8, 1, 7, 3, 12, 9, 6, then the number of node splits is _____

32. Consider a two-dimensional array A[0..9] [0..19]. Each element occupies one byte and A is stored in row major order starting from location 100. The address of element A[7][15] is _____

33. Consider the following set of messages with their frequencies:

Message	Frequency
A	50 million
B	10 million
C	24 million
D	36 million

What will be the percentage improvement for total binary stream transmission using Huffman encoding over simple encoding?

(A) 7.14% (B) 5% (C) 6.66% (D) None of these

34. Consider the following C-like code:

```
for (i = 1; i <= n; i++)
    for(j = i; j < i^2; j++)
        do – something(); // takes θ(1) time
```

The time taken by above code is

(A) $\theta(n^2)$ (B) $\theta(n^3)$ (C) $\theta(n^4)$ (D) $\theta(n^2 \log n)$

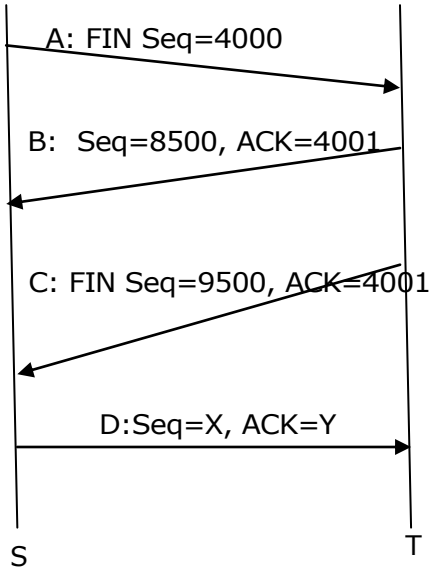
35. Elements 1,2,3,4,5 are inserted in a stack in sequence. The elements are printed while popping them out. Which of the following is wrong print sequence?

(A) 3 5 4 2 1 (B) 1 3 2 4 5 (C) 5 4 3 2 1 (D) 2 4 1 5 3

36. In a 8 Gbps line, it takes 4 sec to wrap around the sequence number. How many bits were used for sequence number?

(A) 37 bits (B) 34 bits (C) 30 bits (D) 32 bits

37. TCP connection termination using three-way handshaking is shown below.



Consider the following statements about this termination:

I. Between B and C, both way communication is possible.
II. Between B and C, T can still send data if T wants but S can't.
III. X's value is 4000
IV. Y's value is 9500

Which of the above statements is/are true?

(A) II only
(B) I, III and IV only
(C) I and II only
(D) II, III and IV only

38. The poset [{2, 3, 5, 30, 60, 120, 180, 360}: /] is

(A) A join semi lattice
(B) A meet semi lattice
(C) Lattice
(D) not a semi lattice

39. Consider the syntax directed translation scheme given below:

$S \rightarrow L$	$S.val = L.val$
$L \rightarrow L1B$	$L.val = L_1.val * 2 + B.val$
$L \rightarrow B$	$L.val = B.val$
$B \rightarrow 0$	$B.val = 0$
$B \rightarrow 1$	$B.val = 1$

If the input string is 1101, then the value of attribute of starting symbol is

(A) 5 (B) 13 (C) 110 (D) 20

40. What is the language accepted by the following CFG?

$S \rightarrow bS \mid aB$
$A \rightarrow bA \mid b \mid aS$
$B \rightarrow aS \mid bA \mid b$

(A) Strings over $\Sigma = \{a, b\}$ contains even number of a's and ends with b

(B) Strings over $\Sigma = \{a, b\}$ contains odd number of a's and ends with b

(C) Strings over $\Sigma = \{a, b\}$ contains odd number of b's and ends with a

(D) None of these

41. Consider the following table for priority (Non Preemptive) scheduling algorithm.

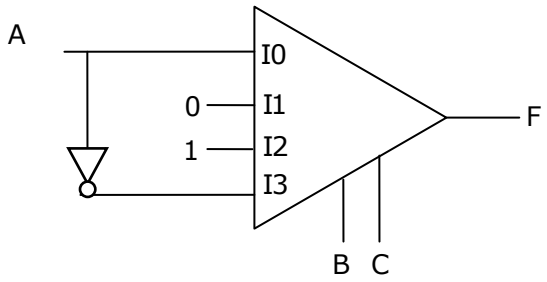
Priority	P. No	Arrival Time	Burst Time
4	1	0	4
5	2	1	5
6	3	2	8
8	4	3	6
2	5	4	3
12	6	5	5

If highest integer is highest priority, then the completion time of process P_6 is _____

42. Given a graph G is a connected planar simple graph with 'e' edges and 'v' vertices, with $v \geq 3$ and if all cycles in G have length ≥ 4, then which of the following relations hold always?

(A) $e \leq 2v - 4$ (B) $e \leq 2v - 2$ (C) $e \leq 3v - 4$ (D) None of these

43. A Boolean function $F(A,B,C)$ is implemented using a $4:1$ multiplexer as shown below.

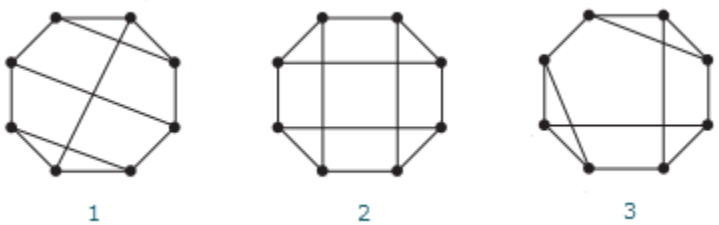


What is F?

(A) $F(A,B,C) = \sum m(2,3,4,5)$ (B) $F(A,B,C) = \sum m(2,3,4,6)$

(C) $F(A,B,C) = \sum m(1,3,4,6)$ (D) $F(A,B,C) = \sum m(0,3,4,7)$

44. Which of the following graphs are isomorphic?



(A) 1 and 2 (B) 1 and 3 (C) All three (D) None of these

45. If $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & 2 & 1 \\ 0 & 0 & 3 \end{bmatrix}$ then $P^{-1} A^2 P =$

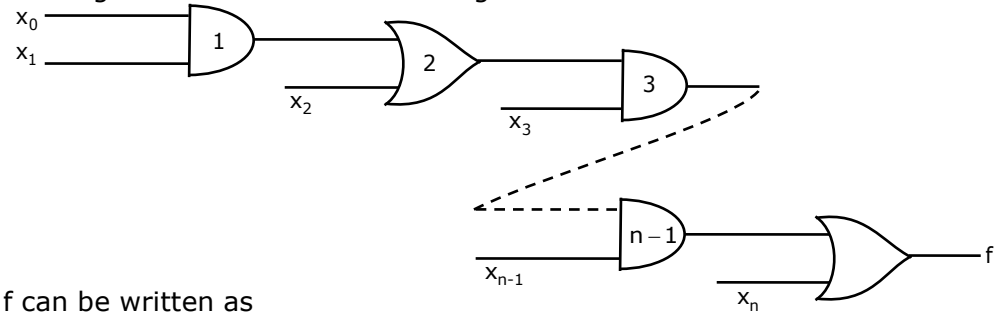
(A) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 9 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \\ 0 & 0 & \frac{1}{3} \end{bmatrix}$

46. If $f(x)= x+\sin x$, by using Newton-Raphson method to find a root, the recurrence relation is

(A) $x_{n+1} = \dfrac{x_n \cos x_n - \sin x_n}{1 + \cos x_n}$ (B) $x_{n+1} = \dfrac{x_n \cos x_n + \sin x_n}{x_n + \sin x_n}$

(C) $x_{n+1} = \dfrac{x_n \cos x_n - \sin x_n}{x_n + \sin x_n}$ (D) $\cos x_n = n_{n+1} + \sin x_n$

47. In the given network of AND & OR gates



f can be written as

(A) $x_0x_1x_2...x_n + x_1x_2...x_n + x_2x_3...x_n...x_n$

(B) $x_0x_1 + x_2x_3 + ... + x_{n-1}x_n$

(C) $x_0 + x_1 + x_2 + ... + x_n$

(D) $x_0x_1x_3...x_{n-1} + x_2x_3x_5...x_{n-1} + ... + x_{n-2}x_{n-1} + x_n$

Common Data Questions: 48 & 49

Disk requests come in a disk queue for cylinders 5, 15, 73, 90, 11, 4, 55, 42 in order. One end of the disk is at cylinder 0 and another end is at cylinder 99.

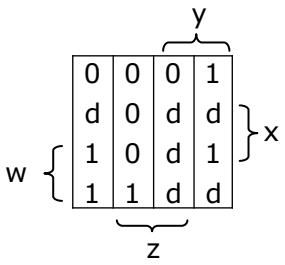
48. If the disk head is currently at cylinder 60, then how many total head movements will occur, if SSTF scheduling technique is used?
(A) 134 (B) 142 (C) 146 (D) 150

Disk requests come in a disk queue for cylinders 5, 15, 73, 90, 11, 4, 55, 42 in order. One end of the disk is at cylinder 0 and another end is at cylinder 99.

49. If SCAN scheduling is used, what will be the difference of the total head movements if the head is moving towards 0 and if the head is moving towards 99?
(A) 0 (B) 2 (C) 16 (D) 21

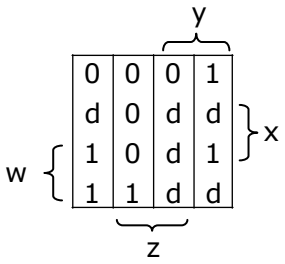
Common Data Questions: 50 & 51

Consider the following $K-$map for the funtion $F(W,X,Y,Z)$:



50. How many EPI's and PI's are there in the $K-$map?
(A) 3 Prime Implicants, 2 EPI's (B) 4 Prime Implicants, 1 EPI's
(C) 4 Prime Implicants, 3 EPI's (D) 4 Prime Implicants, 2 EPI's

Consider the following $K-$map for the funtion $F(W,X,Y,Z)$:



51. What is the simplified SOP expression for the function F?
(A) $ywz + wz' + yz'$ (B) $xz' + yz' + wx'$
(C) $wz' + wx' + yz'$ (D) Both (B) and (C)

Linked Answer Questions: Q.52 to Q.55 Carry Two Marks Each

Statement for Linked Answer Questions: 52 & 53

A magnetic disk has density 40×10^6 bits/square inch, inner diameter of recording area is 4 inch and outer diameter is 7 inch. Ignore inter track spacing.

52. If radial spacing density is 2000 track/inch, then what is the average bit density/track?
(A) 150.7 kb (B) 162.5 kb (C) 170 kb (D) 172.7 kb

A magnetic disk has density 40×10^6 bits/square inch, inner diameter of recording area is 4 inch and outer diameter is 7 inch. Ignore inter track spacing.

53. If the disk is rotating at the speed of 3600 rpm, then what is the data transfer rate?
(A) 1.45 MBps (B) 1.29 MBps (C) 1.56 MBps (D) 1.68 MBps

Statement for Linked Answer Questions: 54 & 55

Consider the following input sequence 010101……..

54. What will be the regular expression to accept all the prefixes of the given sequence?
(A) 0(10)* (B) 0(01)* (C) $0(10)^* + (01)^*$ (D) 0*+ (101)*

Consider the following input sequence 010101……..

55. How many minimum number of states required in a DFA for accepting the correct regular expression?
(A) 3 (B) 2 (C) 4 (D) 5

Q. No. 56 – 60 Carry One Mark Each

Fill in the blanks:

56. There are _____ theories on humour.
(A) Good (B) Tremendous (C) Unified (D) Innumerable

Choose the odd one out:

57. (A) Cricket (B) Tennis (Lawn) (C) Hockey (D) Badminton

Choose the appropriate antonym for the bold word given below:

58. **Linger**
(A) Sojourn (B) Fiery (C) Condone (D) Quilt

Choose a pair that has most similar relationship to the given pair:

59. Mathematics: Integration
(A) Biology: Zoology (B) Trigonometry: Straight lines
(C) Algebra: Differentiation (D) MP: Rajya Sabha

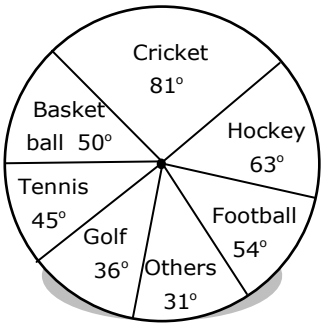
60. $(71+72+73+.....+100) = ?$
(A) 2525 (B) 2565 (C) 2975 (D) 3225

Q. No. 61 – 65 Carry Two Marks Each

61. Find out the odd one.
(A) People pray to God during adversity
(B) Rohini wrung her hands when the train was left
(C) Not everyone bats a hundred in life
(D) One should not succumb to pressure from peers

62. A is thrice as good as workman B. Therefore A is able to finish a job in 60 days less than B. In how many days do they complete the job if they work together?
(A) 45 (B) 90 (C) 30.5 (D) 22.5

63. The following graph shows, spending of a country on various sports during a particular year:



What percentage of the total amount is spent on Tennis?
(A) $13\frac{1}{2}\%$ (B) $12\frac{1}{2}\%$ (C) 11% (D) 10%

64. How many natural numbers are there between 15 and 100 which are exactly divisible by 8?
(A) 8 (B) 11 (C) 10 (D) 12

65. How many different ways can letters of the following word **"LEADING"** be arranged in such a way that vowels always come together?
(A) 620 (B) 720 (C) 600 (D) 580