1 Consider a 33 MHz CPU based system. What is the number of wait states required if it is interfaced with a 60ns memory? Assume a maximum of 10ns delay for additional circuitry like buffering and decoding.

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

2 The number of states required by a Finite State Machine, to simulate the behaviour of a computer with a memory capable of storing 'm' words, with each word being 'n' bits long is

(a) $m \times 2^n$ (b) 2^{m+n} (c) 2^{mn} (d) m+n

3 What is the output of the following C program?

```
#include <stdio.h>
#define SQR(x) (x*x)

int main()
{
  int a;
  int b=4;

  a = SQR(b+2);
  printf("%d\n",a);
  return 0;
}
```

(a) 14 (b) 36 (c) 18 (d) 20

4 Consider the following pseudo-code

```
while ( m < n)
    if ( x > y) and (a < b) then
        a = a+1
        y = y-1
    end if
    m = m+1
end while
```

What is the cyclomatic complexity of the above pseudo-code?

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

5 **What is the number of steps required to derive the string ((() ()) ()) for the following grammar.**

$S \rightarrow SS$

$S \rightarrow (S)$

$S \rightarrow \varepsilon$

(a) 10 (b) 15 (c) 12 (d) 16

6 **The process of modifying IP address information in IP packet headers while in transit across a traffic routing device is called**

(a) Port address translation (PAT) (b) Network address translation (NAT)

(c) Address mapping (d) Port mapping

7 **What does a pixel mask mean?**

(a) string containing only 1's (b) string containing only 0's

(c) string containing two 0's (d) string containing 1's and 0's

8 **In the standard IEEE 754 single precision floating point representation, there is 1 bit for sign, 23 bits for fraction and 8 bits for exponent. What is the precision in terms of the number of decimal digits?**

(a) 5 (b) 6

(c) 7 (d) 8

9 **Let R be the radius of a circle. What is the angle subtended by an arc of length R at the centre of the circle?**

(a) 1 degree (b) 1 radian

(c) 90 degrees (d) π radians

10 **The number of logical CPUs in a computer having two physical quad-core chips with hyper threading enabled is _____.**

(a) 1 (b) 2

(c) 8 (d) 16

11 **An aggregation association is drawn using which symbol?**

(a) A line which loops back on to the same table

(b) A small open diamond at the end of a line connecting two tables

(c) A small closed diamond at the end of a line connecting two tables

(d) A small closed triangle at the end of a line connecting two tables

12 How many states are there in a minimum state deterministic finite automaton accepting the language L = { w | w ϵ (0,1)*, number of 0's is divisible by 2 and number of 1's is divisible by 5, respectively} ?

(a) 7 (b) 9

(c) 10 (d) 11

13 Which of the following is TRUE with respect to a Reference?

(a) A reference can never be NULL

(b) A reference needs an explicit dereferencing mechanism

(c) A reference can be reassigned after it is established

(d) A reference and pointer are synonymous

14 There are 200 tracks on a disk platter and the pending requests have come in the order – 36, 69, 167, 76, 42, 51, 126, 12, and 199. Assume the arm is located at the 100th track and moving towards track 200. If sequence of disc access is 126, 167, 199, 12, 36, 42, 51, 69, and 76 then which disc access scheduling policy is used?

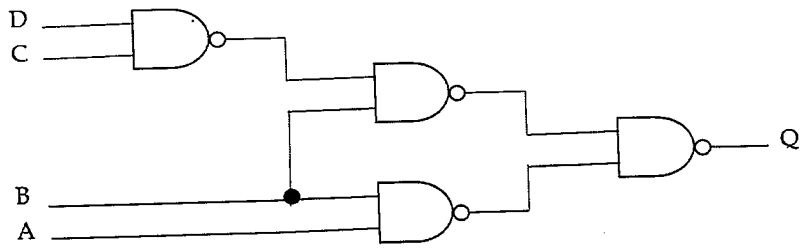
(a) Elevator

(b) Shortest Seek-time First

(c) C-SCAN

(d) First Come First Served

15 Consider the logic circuit given below:



Q = _____ ?

(a) $\bar{A}C + B\bar{C} + CD$

(b) $ABC + \bar{C}D$

(c) $AB + B\bar{C} + B\bar{D}$

(d) $A\bar{B} + A\bar{C} + \bar{C}D$

16 What is routing algorithm used by OSPF routing protocol?

(a) Distance vector (b) Flooding

(c) Path vector (d) Link state

17 If each address space represents one byte of storage space, how many address lines are needed to access RAM chips arranged in a 4 x 6 array, where each chip is 8K x 4 bits?

(a) 13 (b) 15 (c) 16 (d) 17

18 Consider the following segment table in segmentation scheme:

Segment Id	Base	Limit
0	200	200
1	5000	1210
2	1527	498
3	2500	50

What happens if the logical address requested is - Segment Id 2 and Offset 1000?

(a) Fetches the entry at the physical address 2527 for Segment Id 2

(b) A trap is generated

(c) Deadlock

(d) Fetches the entry at offset 27 in Segment Id 3

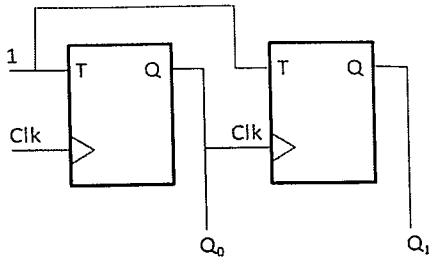
19 The number of bit strings of length 8 that will either start with 1 or end with 00 is _____?

(a) 32 (b) 128 (c) 160 (d) 192

20 Which of the following is not a maturity level as per Capability Maturity Model?

(a) Initial (b) Measurable (c) Repeatable (d) Optimized

21 Consider the following sequential circuit.



What are values of Q_0 and Q_1 after 4 clock cycles, if the initial values are 00 ?

(a) 11 (b) 01 (c) 10 (d) 00

22 Consider the schema R (A, B, C, D) and the functional dependencies $A \rightarrow B$ and $C \rightarrow D$. If the decomposition is made as R_1 (A, B) and R_2 (C, D), then which of the following is TRUE?

(a) Preserves dependency but cannot perform lossless join

(b) Preserves dependency and performs lossless join

(c) Does not preserve dependency and cannot perform lossless join

(d) Does not preserve dependency but performs lossless join

23 The test suite (set of test input) used to perform unit testing on a module could cover 70% of the code. What is the reliability of the module if the probability of success is 0.95 during above testing?

(a) 0.665 to 0.95 (b) At the most 0.665

(c) At the most 0.95 (d) At least 0.665

24 In a system an RSA algorithm with p = 5 and q = 11, is implemented for data security. What is the value of the decryption key if the value of the encryption key is 27?

(a) 3 (b) 7 (c) 27 (d) 40

25 Suppose you want to build a memory with 4 byte words and a capacity of 2^{21} bits. What is type of decoder required if the memory is built using 2K x 8 RAM chips?

(a) 5 to 32 (b) 6 to 64 (c) 4 to 16 (d) 7 to 128

26 **The output of a tristate buffer when the enable input in 0 is**

(a) Always 0

(b) Always 1

(c) Retains the last value when enable input was high

(d) Disconnected state

27 **How many different BCD numbers can be stored in 12 switches? (Assume two position or on-off switches).**

(a) 2^{12} (b) $2^{12}-1$ (c) 10^{12} (d) 10^{3}

28 **Suppose there are eleven items in sorted order in an array. How many searches are required on the average, if binary search is employed and all searches are successful in finding the item?**

(a) 3.00 (b) 3.46 (c) 2.81 (d) 3.33

29 **Consider the following Java code fragment. Which of the following statement is true?**

Line No	Code Statement
1	public class While
2	{
3	public void loop()
4	{
5	int x = 0;
6	while (1)
7	{
8	System.out.println("x plus one is " + (x+1));
9	}
10	}
11	}

(a) There is syntax error in line no. 1 (b) There are syntax errors in line nos. 1 & 6

(c) There is syntax error in line no. 8 (d) There is syntax error in line no. 6

30 Every time the attribute A appears, it is matched with the same value of attribute B but not the same value of attribute C. Which of the following is true?

(a) A -> (B,C)
A -> B, C ->> A

(b) A -> B, A ->> C

(d) A ->> B, B -> C

31 A IP packet has arrived in which the fragmentation offset value is 100, the value of HLEN is 5 and the value of total length field is 200. What is the number of the last byte?

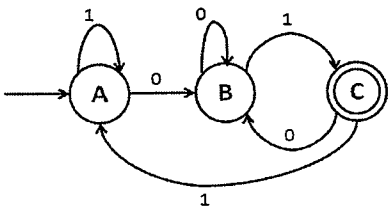
(a) 194 (b) 394 (c) 979 (d) 1179

32 What is the output of the following C program?

```
#include <stdio.h>
void main (void)
{
  int shifty;
  shifty = 0570;
  shifty = shifty >> 4;
  shifty = shifty << 6;
  printf("The value of shifty is %o \n",shifty);
}
```

(a) The value of shifty is 15c0
(b) The value of shifty is 4300
(c) The value of shifty is 5700
(d) The value of shifty is 2700

33 The following Finite Automaton recognizes which of the given languages?



(a) { 1 , 0 } * { 0 1 }
(b) { 1 , 0 } * { 1 }
(c) { 1 } {1, 0 } * { 1 }
(d) 1* 0* { 0, 1 }

34 How much memory is required to implement z-buffer algorithm for a 512 x 512 x 24 bit-plane image

(a) 768 KB (b) 1 MB (c) 1.5 MB (d) 2 MB

35 Using the page table shown below, translate the physical address 25 to virtual address. The address length is 16 bits and page size is 2048 words while the size of the physical memory is four frames.

Page	Present (1-In, 0-Out)	Frame
0	1	3
1	1	2
2	1	0
3	0	-

(a) 25 (b) 6169 (c) 2073 (d) 4121

36 Consider a standard circular queue 'q' implementation (which has same condition for queue full and queue empty) whose size is 11 and the elements of the queue are q[0], q[1], ... q[10]. The front and rear pointers are initialized to point at q[2]. In which position will the ninth element be added?

(a) q[0] (b) q[1] (c) q[9] (d) q[10]

37 The probability that two friends are born in the same month is ___?

(a) 1/6 (b) 1/12 (c) 1/144 (d) 1/24

38 How many lines of output does the following C code produce?

```
#include <stdio.h>

float i = 2.0;
float j = 1.0;
float sum = 0.0;

main()
{
        while ( i / j > 0.001)
        {
                j += j;
                sum = sum + (i / j);
                printf("%f\n", sum);
        }
}
```

(a) 8 (b) 9 (c) 10 (d) 11

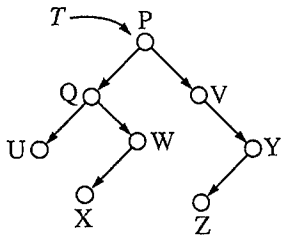
39 If only one memory location is to be reserved for a class variable, no matter how many objects are instantiated, then the variable should be declared as _____.

(a) extern (b) static (c) volatile (d) const

40 Assume that a 16 bit CPU is trying to access a double word starting at an odd address. How many memory operations are required to access the data?

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

41 Consider the following binary search tree T given below. Which node contains the fourth smallest element in T?



(a) Q (b) V (c) W (d) X

42 Let x,y,z,a,b,c be the attributes of an entity set E. If {x}, {x,y}, {a,b}, {a,b,c}, {x,y,z} are superkeys then which of the following are the candidate keys?

(a) {x,y} and {a,b} (b) {x} and {a,b}

(c) {x,y,z} and {a,b,c} (d) {z} and {c}

43 The five items: A, B, C, D, and E are pushed in a stack, one after the other starting from A. The stack is popped four times and each element is inserted in a queue. Then two elements are deleted from the queue and pushed back on the stack. Now one item is popped from the stack. The popped item is _____.

(a) A (b) B (c) C (d) D

44 A computer has sixteen pages of virtual address space but the size of main memory is only four frames. Initially the memory is empty. A program references the virtual pages in the order of 0,2,4,5,2,4,3,11,2,10. How many page faults occur if LRU page replacement algorithm is used?

(a) 3 (b) 5 (c) 7 (d) 8

45 **Consider a 50 kbps satellite channel with a 500 milliseconds round trip propagation delay. If the sender wants to transmit 1000 bit frames, how much time will it take for the receiver to receive the frame?**

(a) 250 milliseconds (b) 20 milliseconds

(c) 520 milliseconds (d) 270 milliseconds

46 **If the maximum output voltage of a DAC is V volts and if the resolution is R bits, then the weight of the most significant bit is _____.**

(a) $V/(2^R - 1)$ (b) $(2^{R-1}).V / (2^R-1)$

(c) $(2^{R-1}).V$ (d) $V/(2^{R-1})$

47 **The following three 'C' language statements is equivalent to which single statement?**

```
y = y+1;
z = x+y;
x = x+1;
```

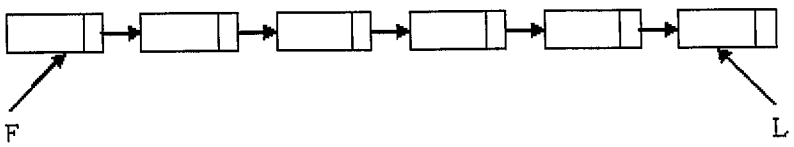
(a) z = x+y+2; (b) z = (x++) + (++y);

(c) z = (++x) + (y++); (d) z = (x++) + (++y) + 1;

48 **A frame buffer array is addressed in row-major order for a monitor with pixel locations starting from (0, 0) and ending with (100, 100). What is address of the pixel (6, 10)? Assume one bit storage per pixel and starting pixel location is at 0.**

(a) 1016 (b) 1006 (c) 610 (d) 616

49 **Consider a single linked list where F and L are pointers to the first and last elements respectively of the linked list. The time for performing which of the given operations depends on the length of the linked list?**



(a) Delete the first element of the list

(b) Interchange the first two elements of the list

(c) Delete the last element of the list

(d) Add an element at the end of the list

50 Let A be a finite set having x elements and let B be a finite set having y elements. What is the number of distinct functions mapping B into A.

(a) x^y (b) $2^{(x+y)}$ (c) y^x (d) y! / (y-x)!

51 Which of the following is NOT represented in a subroutine's activation record frame for a stack-based programming language?

(a) Values of local variables

(b) Return address

(c) Heap area

(d) Information needed to access non local variables

52 Consider the following grammar.

$S \rightarrow AB$

$A \rightarrow a$

$A \rightarrow BaB$

$B \rightarrow bbA$

Which of the following statements is FALSE?

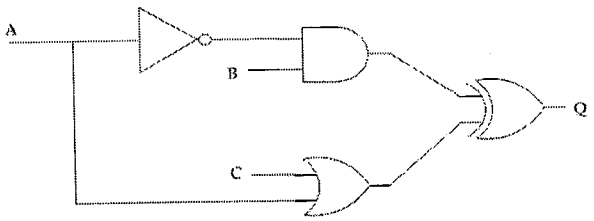
(a) The length of every string produced by this grammar is even

(b) No string produced by this grammar has three consecutive a's

(c) The length of substring produced by B is always odd.

(d) No string produced by this grammar has four consecutive b's

53 Consider the logic circuit given below.



The inverter, AND and OR gates have delays of 6, 10 and 11 nanoseconds respectively. Assuming that wire delays are negligible, what is the duration of glitch for Q before it becomes stable?

(a) 5 (b) 11 (c) 16 (d) 27

54 The conic section that is obtained when a right circular cone is cut through a plane that is parallel to the side of the cone is called _____?

(a) Parabola (b) Hyperbola (c) Circle (d) Ellipse

55 **An IP packet has arrived with the first 8 bits as 0100 0010. Which of the following is correct?**

(a) The number of hops this packet can travel is 2.

(b) The total number of bytes in header is 16 bytes.

(c) The upper layer protocol is ICMP

(d) The receiver rejects the packet

56 **Which of the following is not a valid Boolean algebra rule?**

(a) $X.X = X$

(b) $(X+Y).X = X$

(c) $\overline{X}+XY = Y$

(d) $(X+Y).(X+Z) = X+YZ$

57 **A supernet has a first address of 205.16.32.0 and a supernet mask of 255.255.248.0. A router receives four packets with the following destination addresses. Which packet belongs to this supernet?**

(a) 205.16.42.56 (b) 205.17.32.76 (c) 205.16.31.10 (d) 205.16.39.44

58 **Assume the following information.**

Original timestamp value = 46
Receive timestamp value = 59
Transmit timestamp value = 60
Timestamp at arrival of packet = 69

Which of the following statements is correct?

(a) Receive clock should go back by 3 milliseconds

(b) Transmit and receive clocks are synchronized

(c) Transmit clock should go back by 3 milliseconds

(d) Receive clock should go ahead by 1 millisecond

59 **Which of the following is FALSE with respect to possible outcomes of executing a Turing Machine over a given input?**

(a) It may halt and accept the input (b) It may halt by changing the input

(c) It may halt and reject the input (d) It may never halt

60 Suppose you are browsing the world wide web using a web browser and trying to access the web servers. What is the underlying protocol and port number that are being used?

(a) UDP, 80 (b) TCP, 80 (c) TCP, 25 (d) UDP, 25

61 A mechanism or technology used in Ethernet by which two connected devices choose common transmission parameters such as speed, duplex mode and flow control is called

(a) Autosense (b) Synchronization

(c) Pinging (d) Auto negotiation

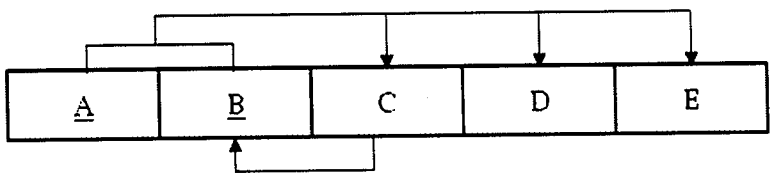
62 Consider the following sorting algorithms.

I. Quicksort
II. Heapsort
III. Mergesort

Which of them perform in least time in the worst case?

(a) I and II only (b) II and III only (c) III only (d) I, II and III

63 Consider the following Table



The table is in which normal form?

(a) First Normal Form (b) Second Normal Form

(c) Third Normal Form but not BCNF (d) Third Normal Form and BCNF

64 Consider a 13 element hash table for which f(key) = key mod 13 is used with integer keys. Assuming linear probing is used for collision resolution, at which location would the key 103 be inserted, if the keys 661, 182, 24 and 103 are inserted in that order?

(a) 0 (b) 1 (c) 11 (d) 12

65 A cube of side 1 unit is placed in such a way that the origin coincides with one of its top vertices and the three axes run along three of its edges. What are the co-ordinates of the vertex which is diagonally opposite to the vertex whose co-ordinates are (1, 0, 1)?

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

66 Consider a system where each file is associated with a 16-bit number. For each file, each user should have the read and write capability. How much memory is needed to store each user's access data?

(a) 16 KB (b) 32 KB (c) 64 KB (d) 128 KB

67 What is the time complexity for the following C module? Assume that n > 0;

```
int module(int n)
{
        if( n = = 1)
                return 1;
        else
                return ( n + module(n-1));
}
```

(a) O(n) (b) O(log n) (c) $O(n^2)$ (d) O(n!)

68 What is the minimum number of resources required to ensure that deadlock will never occur, if there are currently three processes P_1, P_2, and P_3 running in a system whose maximum demand for the resources of same type are 3, 4 and 5 respectively.

(a) 3 (b) 7 (c) 9 (d) 10

69 For a software project, the spiral model was employed. When will the spiral stop?

(a) When the software product is retired

(b) When the software product is released after Beta testing

(c) When the risk analysis is completed

(d) After completing five loops

70 Dirty bit is used to indicate which of the following?

(a) A page fault has occurred

(b) A page has corrupted data

(c) A page has been modified after being loaded into cache

(d) An illegal access of page

71 Which of the following is not a valid multicast MAC address?

(a) 01:00:5E:00:00:00 (b) 01:00:5E:00:00:FF

(c) 01:00:5E:00:FF:FF (d) 01:00:5E:FF:FF:FF

72 The rank of the matrix $A = \begin{bmatrix} 1 & 2 & 1 & -1 \\ 9 & 5 & 2 & 2 \\ 7 & 1 & 0 & 4 \end{bmatrix}$ is _____.

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

73 How many different trees are there with four nodes A, B, C and D?

(a) 30 (b) 60 (c) 90 (d) 120

74 What is the median of the data if its mode is 15 and the mean is 30?

(a) 20 (b) 25 (c) 22.5 (d) 27.5

75 An organization is granted the block 130.34.12.64 / 26. It needs to have four subnets. Which of the following is not an address of this organization?

(a) 130.34.12.124 (b) 130.34.12.89

(c) 130.34.12.70 (d) 130.34.12.132

76 Consider the following scenario.

A web client sends a request to a web server. The web server transmits a program to that client and is executed at client. It creates a web document. What are such web documents called?

(a) Active (b) Static (c) Dynamic (d) Passive

77 What is the size of the physical address space in a paging system which has a page table containing 64 entries of 11 bit each (including valid/invalid bit) and a page size of 512 bytes?

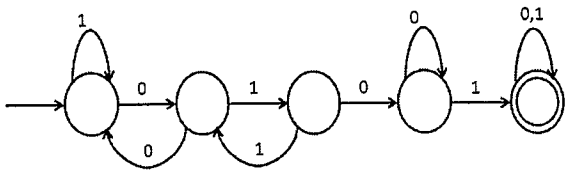
(a) 2^{11} (b) 2^{15} (c) 2^{19} (d) 2^{20}

78 **Which of the following is not an optimization criterion in the design of a CPU scheduling algorithm?**

(a) Minimum CPU utilization (b) Maximum throughput

(c) Minimum turnaround time (d) Minimum waiting time

79 **Consider the following Deterministic Finite Automaton M.**



Let S denote the set of eight bit strings whose second, third, sixth and seventh bits are 1. The number of strings in S that are accepted by M is

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

80 **A Computing architecture, which allows the user to use computers from multiple administrative domains to reach a common goal is called as**

(a) Grid Computing (b) Neural Networks

(c) Parallel Processing (d) Cluster Computing