COMPUTER SCIENCE AND APPLICATIONS

1. A file is downloaded in a home computer using a 56 kbps MODEM connected to an Internet Service Provider. If the download of file completes in 2 minutes, what is the maximum size of data downloaded ?
(A) 112 Mbits (B) 6.72 Mbits
(C) 67.20 Mbits (D) 672 Mbits

2. In _____ CSMA protocol, after the station finds the line idle, it sends or refrains from sending based on the outcome of a random number generator.
(A) Non-persistent
(B) 0-persistent
(C) 1-persistent
(D) p-persistent

3. Which of the following substitution technique have the relationship between a character in the plaintext and a character in the ciphertext as one-to-many ?
(A) Monoalphabetic
(B) Polyalphabetic
(C) Transpositional
(D) None of the above

4. What is the maximum length of CAT-5 UTP cable in Fast Ethernet network ?
(A) 100 meters (B) 200 meters
(C) 1000 meters (D) 2000 meters

5. The _____ is a set of standards that defines how a dynamic web document should be written, how input data should be supplied to the program, and how the output result should be used.
(A) Hyper Text Markup Language
(B) File Transfer Protocol
(C) Hyper Text Transfer Protocol
(D) Common Gateway Interface

6. The count-to-infinity problem is associated with
(A) Flooding algorithm
(B) Hierarchical routing algorithm
(C) Distance vector routing algorithm
(D) Link state routing algorithm

7. The IEEE single-precision and double-precision format to represent floating-point numbers, has a length of _____ and _____ respectively.
(A) 8 bits and 16 bits
(B) 16 bits and 32 bits
(C) 32 bits and 64 bits
(D) 64 bits and 128 bits

8. Consider an undirected graph G with 100 nodes. The maximum number of edges to be included in G so that the graph is not connected is
(A) 2451 (B) 4950
(C) 4851 (D) 9900

9. The amortized time complexity to perform _____ operation(s) in Splay trees is O(Ig n).
(A) Search
(B) Search and Insert
(C) Search and Delete
(D) Search, Insert and Delete

10. Suppose that the splits at every level of Quicksort are in proportion 1-β to β, where $0 < \beta \leq 0.5$ is a constant. The number of elements in an array is n. The maximum depth is approximately
(A) $0.5\ \beta\ \text{Ig}\ n$
(B) $0.5\ (1 - \beta)\ \text{Ig}\ n$
(C) $-(\text{Ig}\ n)/(\text{Ig}\ \beta)$
(D) $-(\text{Ig}\ n)/\text{Ig}\ (1 - \beta)$

11. The minimum number of nodes in a binary tree of depth d (root is at level 0) is

(A) $2^d - 1$ (B) $2^{d+1} - 1$

(C) $d + 1$ (D) d

12. The efficient data structure to insert/delete a number in a stored set of numbers is

(A) Queue

(B) Linked list

(C) Doubly linked list

(D) Binary tree

13. The number of states in a minimal deterministic finite automaton corresponding to the language $L = \{ a^n \mid n \geq 4 \}$ is

(A) 3 (B) 4

(C) 5 (D) 6

14. Regular expression for the language $L = \{ w \in \{0, 1\}^* \mid w$ has no pair of consecutive zeros$\}$ is

(A) $(1 + 010)^*$

(B) $(01 + 10)^*$

(C) $(1 + 010)^* (0 + \lambda)$

(D) $(1 + 01)^* (0 + \lambda)$

15. Consider the following two languages :

$L_1 = \{a^n b^l a^k \mid n + l + k > 5 \}$

$L_2 = \{a^n b^l a^k \mid n > 5, l > 3, k \leq l \}$

Which of the following is true ?

(A) L_1 is regular language and L_2 is not regular language.

(B) Both L_1 and L_2 are regular languages.

(C) Both L_1 and L_2 are not regular languages.

(D) L_1 is not regular language and L_2 is regular language.

16. LL grammar for the language $L = \{a^n b^m c^{n+m} \mid m \geq 0, n \geq 0\}$ is

(A) $S \rightarrow aSc \mid S_1 ; S_1 \rightarrow bS_1c \mid \lambda$

(B) $S \rightarrow aSc \mid S_1 \mid \lambda ; S_1 \rightarrow bS_1c$

(C) $S \rightarrow aSc \mid S_1 \mid \lambda ; S_1 \rightarrow bS_1c \mid \lambda$

(D) $S \rightarrow aSc \mid \lambda ; S_1 \rightarrow bS_1c \mid \lambda$

17. Assume the statements S_1 and S_2 given as :

S_1 : Given a context free grammar G, there exists an algorithm for determining whether L(G) is infinite.

S_2 : There exists an algorithm to determine whether two context free grammars generate the same language.

Which of the following is true ?

(A) S_1 is correct and S_2 is not correct.

(B) Both S_1 and S_2 are correct.

(C) Both S_1 and S_2 are not correct.

(D) S_1 is not correct and S_2 is correct.

18. The number of eight-bit strings beginning with either 111 or 101 is _____.

(A) 64

(B) 128

(C) 265

(D) None of the above

19. Find the number of ways to paint 12 offices so that 3 of them will be green, 2 of them pink, 2 of them yellow and the rest ones white.

(A) 55,440 (B) 1,66,320

(C) 4.790E+08 (D) 39,91,680

20. Consider the following statements :

(i) A graph in which there is a unique path between every pair of vertices is a tree.

(ii) A connected graph with e = v – 1 is a tree.

(iii) A graph with e = v – 1 that has no circuit is a tree.

Which of the above statements is/are true ?

(A) (i) & (iii)

(B) (ii) & (iii)

(C) (i) & (ii)

(D) All of the above

21. Consider the In-order and Post-order traversals of a tree as given below :

In-order : j e n k o p b f a c l g m d h i

Post-order : j n o p k e f b c l m g h i d a

The Pre-order traversal of the tree shall be

(A) a b f e j k n o p c d g l m h i

(B) a b c d e f j k n o p g l m h i

(C) a b e j k n o p f c d g l m h i

(D) j e n o p k f b c l m g h i d a

22. A simple graph G with n-vertices is connected if the graph has

(A) (n – 1) (n – 2)/2 edges

(B) more than (n – 1) (n – 2)/2 edges

(C) less than (n – 1) (n – 2)/2 edges

(D) $\sum_{i=1}^{k} C(n_i, 2)$ edges

23. Which one of the following set of gates is best suited for 'parity' checking and 'parity' generation ?

(A) AND, OR, NOT

(B) NAND, NOR

(C) EX-OR, EX-NOR

(D) None of the above

24. The quantification $\exists!x\ P(x)$ denotes the proposition "There exists a unique x such that P(x) is true", express the quantification using universal and existential quantifications and logical operators :

(A) $\exists x\ P(x) \vee \forall x \forall y\ ((P(x) \vee P(y)) \rightarrow x = y)$

(B) $\forall\ x\ P(x) \wedge \forall x \forall y\ ((P(x) \vee P(y)) \rightarrow x = y)$

(C) $\exists x\ P(x) \wedge \forall x \forall y\ ((P(x) \wedge P(y)) \rightarrow x = y)$

(D) $\exists x\ P(x) \wedge \exists x \exists y\ ((P(x) \vee P(y)) \rightarrow x = y)$

25. If F and G are Boolean functions of degree n. Then, which of the following is true ?

(A) $F \leq F + G$ and $F\ G \leq F$

(B) $G \leq F + G$ and $F\ G \geq G$

(C) $F \geq F + G$ and $F\ G \leq F$

(D) $G \geq F + G$ and $F\ G \leq F$

26. Match the following identities/laws to their corresponding name :

(a)	$x + x = x$, $x \bullet x = x$	i. Dominance
(b)	$x + 0 = x$, $x \bullet 1 = x$	ii. Absorption
(c)	$x + 1 = 1$, $x \bullet 0 = 0$	iii. Idempotent
(d)	$x \bullet (x + y) = x$	iv. Identity

Codes :

	(a)	(b)	(c)	(d)
(A)	iii	iv	i	ii
(B)	iv	iii	i	ii
(C)	iv	iii	ii	i
(D)	iii	iv	ii	i

27. In which one of the following, continuous process improvement is done ?

(A) ISO9001

(B) RMMM

(C) CMM

(D) None of the above

28. The _____ of a program or computing system is the structure or structures of the system, which comprise software components, the externally visible properties of these components, and the relationship among them.
(A) E-R diagram
(B) Data flow diagram
(C) Software architecture
(D) Software design

29. Working software is not available until late in the process in
(A) Waterfall model
(B) Prototyping model
(C) Incremental model
(D) Evolutionary Development model

30. Equivalence partitioning is a _____ testing method that divides the input domain of a program into classes of data from which test cases can be derived.
(A) White box (B) Black box
(C) Regression (D) Smoke

31. Consider the following characteristics :
(i) Correct and unambiguous
(ii) Complete and consistent
(iii) Ranked for importance and/or stability and verifiable
(iv) Modifiable and Traceable
Which of the following is true for a good SRS ?
(A) (i), (ii) and (iii)
(B) (i), (iii) and (iv)
(C) (ii), (iii) and (iv)
(D) (i), (ii), (iii) and (iv)

32. Linked Lists are not suitable for _____.
(A) Binary Search
(B) Polynomial Manipulation
(C) Insertion
(D) Radix Sort

33. What is the size of the following Union ? Assume that the size of int = 2, size of float = 4, size of char = 1

```
union tag {
int a;
float b;
char c;
};
```

(A) 2 (B) 4
(C) 1 (D) 7

34. What is the output of the following program segment ?

```
sum(n)
{
    if ( n < 1 ) return n;
    else return (n + sum(n–1));
}
main()
{
    printf("%d", sum(5));
}
```

(A) 10 (B) 16
(C) 15 (D) 14

35. Assume that x and y are non-zero positive integers. What does the following program segment perform ?

```
while (x!=0)
{
if (x>y)
  x = x-y
  else
  y=y-x;
printf("%d",x);
```

(A) Computes LCM of two numbers
(B) Computes GCD of two numbers
(C) Divides large number with small number
(D) Subtracts smaller number from large number

36. Consider the following program segment :

```
d=0;
for(i=1; i<31, ++i)
for(j=1; j<31, ++j)
for(k=1; k<31, ++k)
if ((i+j+k)%3)= = 0);
d = d + 1;
printf("%d", d);
```

The output will be

(A) 9000 (B) 3000
(C) 90 (D) 2700

37. Usage of Preemption and Transaction Rollback prevents _____.

(A) Unauthorised usage of data file
(B) Deadlock situation
(C) Data manipulation
(D) File preemption

38. The _____ language was originally designed as the Transformation Language for Style Sheet facility.

(A) XSTL (B) XML
(C) XQuery (D) XPath

39. Views are useful for _____ unwanted information, and for collecting together information from more than one relation into a single view.

(A) Hiding
(B) Deleting
(C) Highlighting
(D) All of the above

40. The decision tree classifier is a widely used technique for _____.

(A) Classification (B) Association
(C) Partition (D) Clustering

41. Cross_tab displays permit users to view _____ of multidimensional data at a time.

(A) One dimension
(B) Two dimensions
(C) Three dimensions
(D) Multidimensions

42. A method to provide secure transmission of email is called ____.

(A) TLS (B) SA
(C) IPSec (D) PGP

43. Thoma's-write rule is _____.

(A) Two phase locking protocol
(B) Timestamp ordering protocol
(C) One phase locking protocol
(D) Sliding window protocol

44. Match the following :

	List – I Process state transition		**List - II Reason for transition**
a	Ready→ Running	i.	Request made by the process is satisfied or an event for which it was waiting occurs.
b	Blocked→ Ready	ii.	Process wishes to wait for some action by another process.
c	Running→ Blocked	iii.	The process is dispatched.
d	Running→ Ready	iv.	The process is preempted.

Codes :

	a	b	c	d
(A)	iii	i	ii	iv
(B)	iv	i	iii	ii
(C)	iv	iii	i	ii
(D)	iii	iii	ii	i

45. The hit ratio of a Translation Look Aside Buffer (TLAB) is 80%. It takes 20 nanoseconds (ns) to search TLAB and 100 ns to access main memory. The effective memory access time is _____.

(A) 36 ns (B) 140 ns
(C) 122 ns (D) 40 ns

46. Consider the input/output (I/O) requests made at different instants of time directed at a hypothetical disk having 200 tracks as given in the following table :

Serial No.	1	2	3	4	5
Track No.	12	85	40	100	75
Time of arrival	65	80	110	100	175

Assume that :

Current head position is at track no. 65

Direction of last movement is towards higher numbered tracks

Current clock time is 160 milliseconds

Head movement time per track is 1 millisecond.

"look" is a variant of "SCAN" disk-arm scheduling algorithm. In this algorithm, if no more I/O requests are left in current direction, the disk head reverses its direction. The seek times in Shortest Seek First (SSF) and "look" disk-arm scheduling algorithms respectively are :

(A) 144 and 123 milliseconds

(B) 143 and 123 milliseconds

(C) 149 and 124 milliseconds

(D) 256 and 186 milliseconds

47. Assume that an implementation of Unix operating system uses i-nodes to keep track of data blocks allocated to a file. It supports 12 direct block addresses, one indirect block address and one double indirect block address. The file system has 256 bytes block size and 2 bytes for disk block address. The maximum possible size of a file in this system is

(A) 16 MB (B) 16 KB

(C) 70 KB (D) 71 KB

48. Which of the following set of Unix commands will always display "WELCOME" ?

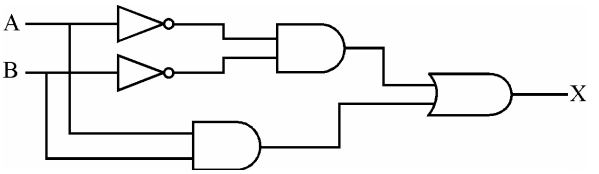
(A) export title=WELCOME; Echo $title

(B) title = WELCOME; export $ title ; sh –c "echo $title"

(C) title = WELCOME; export title ; sh –c "echo $title"

(D) title = WELCOME; echo $title

49. What type of logic circuit is represented by the figure shown below ?



(A) XOR (B) XNOR

(C) XAND (D) XNAND

50. The speed up of a pipeline processing over an equivalent non-pipeline processing is defined by the ratio :

(A) $S = \frac{n\, t_n}{(k + n - 1)t_p}$

(B) $S = \frac{n\, t_n}{(k + n + 1)t_p}$

(C) $S = \frac{n\, t_n}{(k - n + 1)t_p}$

(D) $S = \frac{(k + n - 1)t_p}{n\, t_n}$

Where n $\rightarrow$ no. of tasks

$t_n \rightarrow$ time of completion of each task

k $\rightarrow$ no. of segments of pipeline

$t_p \rightarrow$ clock cycle time

S $\rightarrow$ speed up ratio

Space For Rough Work