COMPUTER SCIENCE & ENGINEERING

PART – I

Each question carries one mark. **50 × 1 = 50**

1. n bits in operation code imply that there are _____ possible distinct operators.
   (A) 2n (B) 2^n
   (C) n/2 (D) n^2

2. In which addressing mode the operand is given explicitly in the instruction ?
   (A) Absolute (B) Immediate
   (C) Indirect (D) Direct

3. For a pipelined CPU with a single ALU, consider the following situations :
   1. The J+1th instruction uses the result of the Jth instruction as an operand
   2. The execution of a conditional jump instruction
   3. The Jth and J + 1th instructions require the ALU at the same time

   Which of the above can cause a hazard ?
   (A) 1 & 2 only (B) 2 & 3 only
   (C) 3 only (D) All the three

4. Which of the following is incorrect ?
   1. In the programmed I/O method, the CPU waits for the I/O devices.
   2. In the Interrupt driven I/O device informs the CPU of its ready status via an interrupt.
   3. In DMA, the CPU sends its I/O to the DMA controller which manages the entire transaction.

   (A) 1 and 2 (B) 2 and 3
   (C) 1, 2 and 3 (D) None of the above

5. 0 0 1 1 0 1 0 1 1 0 1 0 0 1 0 0, the excess-3 code shown is equivalent to decimal
   (A) 2391 (B) 0271
   (C) 5642 (D) 0358

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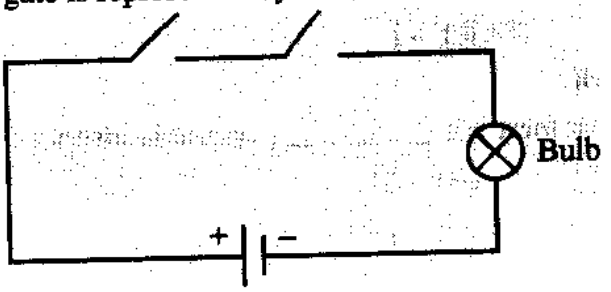
6. What logic gate is represented by the circuit shown below ?



(A) AND
(B) NAND
(C) NOR
(D) EQUIVALENCE

7. The minterms corresponding to decimal number 15 is

(A) ABCD
(B) $\overline{ABCD}$
(C) A' + B' + C' + D'
(D) A + B + C + D

8. How many different trees are possible with 10 nodes ?

(A) 1014
(B) 1200
(C) 50
(D) 68

9. In an AVL tree, at what condition the balancing is to be done ?

(A) Pivotal value is equal to zero
(B) Pivotal value not equal to zero
(C) If the pivotal is greater than 1 or less than 1
(D) If the pivotal value is infinity

10. A 3-ary tree in which every internal node has exactly 3 children. The number of leaf nodes in such a tree with 6 internal nodes will be

(A) 10
(B) 11
(C) 12
(D) 13

11. The number of nodes in the largest maximal independent set of the complete bipartite graph K(4, 2) is

(A) 2
(B) 3
(C) 4
(D) 6

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12. A full binary tree with n non-leaf nodes contains

(A) Log 2n nodes (B) n + 1 nodes

(C) 2n nodes (D) 2n + 1 nodes

13. Algorithm which solves the all pairs shortest path problem is

(A) Dijkstra's algorithm (B) Floyd's algorithm

(C) Prim's algorithm (D) Warshall's algorithm

14. The height of a 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}

15. The algorithm design technique used in the quick sort algorithm is

(A) Dynamic programming (B) Backtracking

(C) Divide and Conquer (D) Greedy method

16. How many distinct binary search trees can be created out of 4 distinct keys ?

(A) 42 (B) 24

(C) 14 (D) 5

17. The following numbers are inserted into an empty binary search tree in the given order: 10, 1, 3, 5, 15, 12, and 16. What is the height of the binary search tree (the height is the maximum distance of a leaf node from the root) ?

(A) 4 (B) 6

(C) 2 (D) 3

18. What is the purpose of flow control ?

(A) To ensure that data is retransmitted if an acknowledgment is not received.

(B) To reassemble segments in the correct order at the destination device.

(C) To provide a means for the receiver to govern the amount of data sent by the sender.

(D) To regulate the size of each segment.

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19. Acknowledgements, sequencing, and flow control are characteristics of which OSI layer ?

(A) Layer 2 (B) Layer 3

(C) Layer 4 (D) Layer 7

20. What is the powerful, centralized computer system that performs data storage and processing tasks on behalf of clients and other network devices ?

(A) Client (B) Host computer

(C) Terminal (D) Network

21. Error control is needed at the transport layer because of potential errors occurring

(A) from transmission line noise.

(B) in routers.

(C) from out-of-sequence delivery.

(D) from packet losses.

22. Which of the following is responsible for approving standards and allocating resources in the Internet ?

(A) Internet Architecture Board (IAB)

(B) Internet Engineering Task Force (IETF)

(C) Inter NIC

(D) None of above

23. Which of the following is true when describing a multicast address ?

(A) Packets addressed to a unicast address are delivered to a single interface.

(B) Packets are delivered to all interfaces identified by the address. This is also called a one-to-many address.

(C) Identifies multiple interfaces and is only delivered to one address. This address can also be called one-to-one-of-many.

(D) These addresses are meant for non-routing purposes, but they are almost globally unique so it is unlikely they will have an address overlap.

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24. Which of the following is TRUE for the language { a^P : P is Prime} ?
(A) It is not accepted by Turing Machine.
(B) It is regular but not context free.
(C) It is context free but not regular.
(D) It is neither regular nor context free but accepted by Turing Machine.

25. Fortran is
(A) Regular language
(B) Context free language
(C) Context sensitive language
(D) None of the above

26. The equivalent regular expression for the regular expression (aa+bb+ab+ba)*
(A) ((a+b).(a+b))*
(B) (aba+bab+bb)*
(C) ((a+b)+(a+b))*
(D) None of the above

27. Turing machine is capable of accepting
(A) Only Regular Languages and Context Free Languages
(B) Only Context Sensitive Languages
(C) Recursively Enumerable Languages only
(D) All four categories of Languages

28. Context grammar is ambiguous if
(A) the grammar contains useless non-terminals
(B) it produces more than one parse tree for same sentence
(C) some production has two non-terminals side by side on right hand side
(D) None of the above

29. In the design of lexical analyzer
(A) Only finite automata is used
(B) Only regular expression is used
(C) Both finite automata and regular expression are used
(D) Both finite automata and regular expression not are used

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30. The string 1101 does not belong to the set represented by

(A) 110*(0+1)
(B) 1(0+1)*101
(C) (10)*(01)*(00+11)*
(D) (00+(11)*0)*

31. The macro processor must perform

(A) recognize macro definitions and macro calls
(B) save the macro definitions
(C) expand Macro calls
(D) all of these

32. Relocation bits used by relocating loader are specified by

(A) relocating loader itself
(B) linker
(C) assembler
(D) microprocessor

33. A computer cannot 'boot' if it does not have

(A) Compiler
(B) Loader
(C) Operating System
(D) Assembler

34. Linker is

(A) same as loader
(B) required to create a load module
(C) user source code as input
(D) always used before programs are executed

35. The order of the Power set of a Set of order n is

(A) n
(B) 2n
(C) n^2
(D) 2^n

36. Which of the following statements is FALSE ?

(A) The set of rational numbers is an Abelian group under addition.
(B) The set of rational integers is an Abelian group under addition.
(C) The set of rational numbers form an Abelian group under multiplication.
(D) None of the above.

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37. If every element of a group G is its own inverse, then G is
(A) Finite (B) Infinite
(C) Cyclic (D) Abelian

38. A self-complemented distributive lattice is called
(A) Boolean Algebra (B) Modular Lattice
(C) Complete Lattice (D) Self Dual Lattice

39. Hasse diagrams are drawn for
(A) Partially ordered sets (B) Lattices
(C) Equivalence relations (D) None of the above

40. The number of different permutations of the word BANANA is
(A) 720 (B) 60
(C) 120 (D) 360

41. Which of the following is not a fundamental process state ?
(A) Ready (B) Terminated
(C) Executing (D) Blocked

42. Poor response time is usually caused by
(A) Process busy (B) High I/O rates
(C) High paging rates (D) Any of the above

43. SSTF stands for
(A) Shortest-Seek-Time-First scheduling
(B) Small-Small-Time-First
(C) Simple-Seek-Time-First scheduling
(D) Small-Simple-Time-First

44. Virtual memory is
(A) simple to implement
(B) used in all major commercial operating systems
(C) less efficient in utilization of memory
(D) useful when fast I/O devices are not available

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45. To avoid race condition, the maximum number of processes that may be simultaneously inside the critical section is

(A) zero
(B) one
(C) two
(D) more than two

46. _____ is a technique of improving the priority of process waiting in Queue for CPU allocation.

(A) Starvation
(B) Ageing
(C) Revocation
(D) Relocation

47. In the _____ Normal form, a composite attribute is converted to individual attributes.

(A) First
(B) Second
(C) Third
(D) Fourth

48. The relational model is based on the concept that data is organized and stored in two-dimensional tables called _____.

(A) Fields
(B) Records
(C) Relations
(D) Keys

49. _____ specifies a search condition for a group or an aggregate.

(A) GROUP BY Clause
(B) HAVING Clause
(C) FROM Clause
(D) WHERE Clause

50. How DOM differs from SAX ?

(A) DOM is not event driven and builds up the whole memory.
(B) SAX is event driven and requires less space.
(C) DOM and SAX are packages.
(D) None of these.

Space For Rough Work

PART – II

Each question carries two marks. **25 × 2 = 50**

51. If memory access takes 20 ns with cache and 110 ns without it, then the hit ratio (cache uses a 10 ns memory) is

(A) 93% (B) 90%

(C) 87% (D) 88%

52. A hard disk with a transfer rate of 10 M bytes/second is constantly transferring data to memory using DMA. The Processor runs at 600 MHz. and takes 300 and 900 clock cycles to initiate and complete DMA transfer respectively. If the size of the transfer is 20 K bytes, what is the percentage of processor time consumed for the transfer operation ?

(A) 0.1 % (B) 5.0 %

(C) 1.0 % (D) 0.5 %

53. In serial communication employing 8 data bits, a parity bit and 2 stop bits, the minimum baud rate required to sustain a transfer rate of 3000 characters per second is

(A) 2400 baud (B) 19200 baud

(C) 4800 baud (D) 1200 baud

54. What is the content of Stack Pointer (SP) ?

(A) Address of the current instruction

(B) Address of the next instruction

(C) Address of the top element of the stack

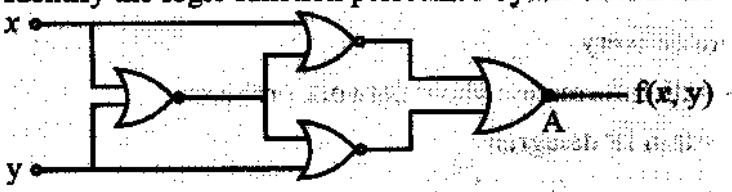
(D) Size of the stack

55. [(A+A'B)(A+A'B')][(CD+C'D')+(C⊕ D)] =

(A) B (B) A

(C) 0 (D) 1

56. Identify the logic function performed by the circuit shown



(A) Exclusive OR (B) Exclusive NOR

(C) NAND (D) NOR

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57. Suppose a circular queue of capacity (n-1) elements is implemented with an array of n elements. Assume that the insertion and deletion operations are carried out using REAR and FRONT as array index variables, respectively. Initially, REAR=FRONT=0.The conditions to delete , queue full and queue empty are

(A) full:(REAR+1)mod n==FRONT
empty:REAR==FRONT

(B) full:(REAR+1)mod n==FRONT
empty:(FRONT+1)MOD N==REAR

(C) full:REAR==FRONT
empty:(REAR+1)mod n==FRONT

(D) full:(FRONT+1)mod n==REAR
empty:REAR==FRONT

58. The recurrent relation capturing the optimal execution time of the Towers of Hanoi problem with n discs is

(A) T(n)=2T(n-2)+2 (B) T(n)= 2T(n-1)+n

(C) T(n)=2T(n/2)+1 (D) T(n)=2T(n-1)+1

59. Name the sorting which takes a list of integers and puts each element on a smaller list, depending techniques takes the value of its least significant byte. Then the small lists are concatenated, and the process is repeated for each most significant byte until the list is sorted.

(A) Radix sort (B) Quick sort

(C) Heap sort (D) Merge sort

60. Which statements are true regarding ICMP packets ?

1. They acknowledge receipt of a TCP segment.
2. They guarantee datagram delivery.
3. They can provide hosts with information about network problems.
4. They are encapsulated within IP datagram.

(A) 1 only (B) 2 and 3

(C) 3 and 4 (D) 2, 3 and 4

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61. Why does the data communication industry use the layered OSI reference model ?

1. It divides the network communication process into smaller and simpler components, thus aiding component development, design, and troubleshooting.
2. It enables equipment from different vendors to use the same electronic components, thus saving research and development funds.
3. It supports the evolution of multiple competing standards and thus provides business opportunities for equipment manufacturers.
4. It encourages industry standardization by defining what functions occur at each layer of the model.

(A) 1 only (B) 1 and 4

(C) 2 and 3 (D) 3 only

62. What are two purposes for segmentation with a bridge ?

1. To add more broadcast domains.
2. To create more collision domains.
3. To add more bandwidth for users.
4. To allow more broadcasts for users.

(A) 1 only (B) 2 and 3

(C) 2 and 4 (D) 4 only

63. Consider the languages:

$L1 = \{a^n b^n c^m : n,m > 0\}$ and $L2 = \{ a^n b^m c^n : n,m > 0\}$. Which of the following statements is FALSE ?

(A) $L1 \cap L2$ is a context free language

(B) L1.L2 is a context free language

(C) L1 and L2 are context free languages

(D) $L1 \cap L2$ is a context sensitive language

64. Which one of the following is not decidable ?

(A) Given a Turing Machine M, a string s and an integer k, M accepts s within k steps.

(B) Equivalence of two Turing Machines.

(C) Languages accepted by given finite state machine is non- empty.

(D) Languages accepted by a context free grammar is non- empty.

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65. A bottom-up parser generates
(A) LMD (B) RMD
(C) RMD in reverse (D) LMD in reverse

66. Backtracking is a problem associated with
(A) Topdown Parsing (B) Bottomup Parsing
(C) Both (A) and (B) (D) None of the above

67. The function f: Z→ z is given by $f(x)=x^2$ is
(A) One-to-one (B) On to
(C) One to One and onto (D) None of the above

68. A U B = A∩ B if and only if
(A) A is empty set (B) B is empty set
(C) A and B are non-empty sets (D) A and B are empty sets

69. Every finite subset of lattice has
(A) a LUB and a GLB (B) Many LUBs and a GLB
(C) Many LUBs and many GLBs (D) Either some LUBs and some GLBs

70. Consider an XML file called intro.xml and a document type definition (DTD) file intro.dtd as follows:
Intro.xml
< ?xml version = "1.0" ?>
<!DOCTYPE myMessage SYSTEM "intro.dtd">
<myMessage>
<message>Welcome to XML</message>
</myMessage>
Intro.dtd
<!ELEMENT myMessage(message)>
<!ELEMENT message(#PCDATA)>
A validating parser will classify intro.xml as
(A) Well-formed and validated
(B) Well-formed but not validated
(C) Validated but not well-formed
(D) Neither validated not well-formed

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71. Let S and Q be two semaphores initialized to 1, where P0 and P1 processes the following statements wait(S);

P0		P1
wait(Q);		wait(Q);
.....;		wait(S);
signal(S);	0	.....;
signal(Q);		signal(Q);
		signal(S);

respectively. The above situation depicts a _____ .

(A) Semaphore (B) Deadlock
(C) Signal (D) Interrupt

72. If the Disk head is located initially at 32, find the number of disk moves required with FCFS if the disk queue of I/O blocks requests are 98, 37,14,124,65,67.

(A) 310 (B) 324
(C) 315 (D) 321

73. Consider a logical address space of 8 pages of 1024 words mapped into memory of 32 frames. How many bits are there in the physical address ?

(A) 9 bits (B) 11 bits
(C) 13 bits (D) 15 bits

74. Using the SQL GROUP BY phrase with a SELECT statement can help detect which of the following problems ?

(A) The multivalue, multicolumn problem
(B) The inconsistent values problem
(C) The missing values problem
(D) The general-purpose remarks column problem

75. A system uses FIFO policy for page replacement. It has 4 page frames with no pages loaded to begin with. The system first accesses first 100 distinct pages in some order and then access the same 100 pages but now in the reverse order. How many page faults will occur ?

(A) 196 (B) 192
(C) 197 (D) 195

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