

1. Which of the following is not a part of an instruction cycle ?
 - (A) Fetch phase
 - (B) Decode phase
 - (C) Execute phase
 - (D) Instruction wait Phase

2. The address of the next instruction to be executed is present in
 - (A) Program Counter
 - (B) Instruction Register
 - (C) Memory Buffer Register
 - (D) Accumulator register

3. A page fault occurs when
 - (A) The required page is corrupted by execution of the application software
 - (B) The required page is present in main memory
 - (C) The required page is not present in memory
 - (D) One tries to divide a number by 0

4. Which of the following can be said about *thrashing* in a virtual memory operating system ?
 - (A) Reduces page I/O
 - (B) Precursor of deadlock
 - (C) Implies excessive page I/O
 - (D) Improves the system performance

5. Relational algebra does not have which one of the following types of operators ?
 - (A) Selection operator
 - (B) Division operator
 - (C) Projection operator
 - (D) Aggregation operator

6. Which one of the following clauses in SQL specifies that : “the query result should be sorted in ascending or descending order based on the values of one or more columns” ?
 - (A) View
 - (B) Order by
 - (C) Group by
 - (D) Having

7. In an RDBMS, a tuple is also known as a :
- (A) Table
 - (B) Relation
 - (C) Row
 - (D) Field
8. What is data integrity ?
- (A) It is the data contained in a database that is non redundant.
 - (B) It is the data contained in a database that is accurate and consistent.
 - (C) It is the data contained in a database that is secured.
 - (D) It is the data contained in a database that is shared.
9. The keyword to eliminate duplicate rows from the query result in SQL is
- (A) DISTINCT
 - (B) NO DUPLICATE
 - (C) UNIQUE
 - (D) None of the above
10. Given that a table is in 2NF, which of the following must be true ?
- (A) No functional dependencies (FDs) exist.
 - (B) No multivalued dependencies (MVDs) exist.
 - (C) No partial FDs exist.
 - (D) No partial MVDs exist.
11. In SQL, testing whether a subquery is empty can be done using :
- (A) DISTINCT
 - (B) UNIQUE
 - (C) NULL
 - (D) EXISTS
12. Which of the following is not a characteristic of a relational database model ?
- (A) Table
 - (B) Tree like structure
 - (C) Complex logical relationship
 - (D) Records

13. Which of the following is the result of the “SELECT” SQL command ?
- (A) TABLE
 - (B) TRIGGER
 - (C) INDEX
 - (D) JOIN
14. A table can have only one :
- (A) Secondary key
 - (B) Alternate key
 - (C) Foreign key
 - (D) Primary key
15. The operation of eliminating some columns in a table is called
- (A) select
 - (B) intersect
 - (C) project
 - (D) union
16. In a C program, the program execution starts from :
- (A) The function which is defined first
 - (B) The main() function
 - (C) The function which is last defined
 - (D) Any function other than main()
17. What is the role of domain name server (DNS) in the Internet ?
- (A) Translate between LAN and WAN protocols
 - (B) Translate between domain name and IP address
 - (C) Supply domain name against user queries
 - (D) Translate between HTML pages and domain names
18. The concept of FSA is extensively used in which part in the design of a compiler ?
- (A) Lexical analyzer
 - (B) Parser
 - (C) Code generator
 - (D) Code optimizer

19. Consider a language L for which there exists a Turing machine T, that accepts every word in L and either rejects or loops for every word that is not in L. The language L is :
- (A) NP hard
 - (B) NP complete
 - (C) Recursive
 - (D) Recursively enumerable
20. A television broadcast is an example of which of the following types of transmission ?
- (A) Simplex
 - (B) Half-duplex
 - (C) Full-duplex
 - (D) Semi-duplex
21. Which one of the following most accurately describes “multiple inheritance” ?
- (A) Where two classes inherit from each other
 - (B) When a base class has two or more derived classes
 - (C) When a child class has two or more parent classes
 - (D) When a child class has both an “is a” and a “has a” relationship with its parent class
22. Let P be a procedure that for some inputs calls itself (i.e., is recursive). If P is guaranteed to terminate, which of the following statements must be true ?
- I. P has a local variable.
 - II. P has an execution path where it does not call itself.
 - III. P either refers to a global variable or has at least one parameter.
- (A) I only
 - (B) II only
 - (C) I and II only
 - (D) II and III only
23. A bridge uses which address in handling a host transmission ?
- (A) Physical
 - (B) Network
 - (C) Transport
 - (D) Session
24. The worst type of coupling among the modules in a software is
- (A) Data coupling
 - (B) Control coupling
 - (C) Stamp coupling
 - (D) Content coupling

25. For a well understood data processing application being developed by a competent and experienced set of developers, which one of the following life cycle models would be appropriate ?
- (A) Waterfall model
 - (B) Prototyping model
 - (C) Evolutionary model
 - (D) Spiral model
26. ER model represents which one of the following views ?
- (A) Static view
 - (B) Functional view
 - (C) Dynamic view
 - (D) Use case view
27. A certain algorithm A has been shown to have a running time $O(N^{2.5})$, where N is the size of the input. Which of the following is NOT true about the algorithm A ?
- (A) $\forall N$, there may be some inputs for which the running time is less than $N^{2.4}$ seconds
 - (B) $\forall N$, there may be some inputs for which the running time is less than $N^{2.6}$ seconds
 - (C) $\forall N$, there may be some inputs for which the running time is more than $N^{2.4}$ seconds
 - (D) $\forall N$, there may be some inputs for which the running time is more than $N^{2.6}$ seconds
28. Adjacency matrix and adjacency lists are suitable for implementing which one of the following data structures ?
- (A) Linked List
 - (B) Queue
 - (C) Tree
 - (D) Graph
29. On a multiple choice test with four possible answers for each question, what is the probability of answering a question correctly if you make a random guess ?
- (A) $1/2$
 - (B) $3/4$
 - (C) $1/4$
 - (D) 1
30. Which of the following represents the basic unit of data storage in RDBMS ?
- (A) Index
 - (B) Query
 - (C) Table
 - (D) None of the above

31. Program development effort is measured in units of :
- (A) Person-months (PM)
 - (B) Rupees (Rs)
 - (C) Persons (P)
 - (D) Months (M)
32. An Equivalence relation is
- (A) Reflexive, Symmetric but not Transitive
 - (B) Reflexive, Symmetric and Transitive
 - (C) Reflexive, Antisymmetric and Transitive
 - (D) Irreflexive, Antisymmetric and Transitive
33. Among all the phases of the waterfall SDLC, which phase typically consumes the maximum effort ?
- (A) Design
 - (B) Maintenance
 - (C) Testing
 - (D) Coding
34. Let A be a nonempty set with cardinality n. The number of subsets of A having odd cardinality is :
- (A) 2^n
 - (B) n^2
 - (C) $n(n-1)/2$
 - (D) 2^{n-1}
35. Which one of the following descriptions best characterizes memory-mapped I/O in computers ?
- (A) The computer provides special instructions for manipulating I/O ports.
 - (B) An I/O port is accessed just like any other memory location.
 - (C) To perform an I/O operation, it is sufficient to place the data in the corresponding device's address register and then call the channel to perform the required operation.
 - (D) Ports are hardwired to specific locations of RAM chips.
36. In a paged memory system, when the page size is increased, what can be said about internal fragmentation ?
- (A) Become less
 - (B) Becomes more
 - (C) Totally eliminated
 - (D) Remains unaffected

37. Recursive descent parsing is an example of :
- (A) Top-down parser
 - (B) Bottom-up parser
 - (C) Predictive parser
 - (D) None of these
38. If $A \times B = \{(3, 2), (3, 4), (5, 2), (5, 4)\}$, then which one of the following can be inferred ?
- (A) $A = \{3, 5\}$ $B = \{2, 4\}$
 - (B) $A = \{4, 3\}$ $B = \{5, 2\}$
 - (C) $A = \{4, 2\}$ $B = \{3, 5\}$
 - (D) $A = \{2, 4\}$ $B = \{3, 5\}$
39. Let $S = \{a, b, c\}$, then the number of elements in the power set of S is :
- (A) 8
 - (B) 16
 - (C) 256
 - (D) 512
40. A regular language is produced by
- (A) Type I grammar
 - (B) Type II grammar
 - (C) Type III grammar
 - (D) Type 0 grammar
41. 'Cycle Stealing' is associated with which of the following ?
- (A) Data transfer among registers
 - (B) DMA
 - (C) Pipelining
 - (D) Microprogramming
42. Among the following types of memories, which one is the fastest ?
- (A) Register
 - (B) Cache
 - (C) RAM
 - (D) Hard disk

43. A type of interrupt in which the external device supplies its address along with the interrupt request is called :
- (A) Vectored interrupt
 - (B) Maskable interrupt
 - (C) Polling
 - (D) Non-maskable interrupt
44. What is the binary representation of the unsigned number 12.75 ?
- (A) 1100.01
 - (B) 1010.11
 - (C) 1100.11
 - (D) 1010.01
45. Which of the following is true about a parity checking scheme ?
- (A) Can detect single bit error
 - (B) Can detect double-bit error
 - (C) Can detect and correct single bit error
 - (D) Can detect and correct double-bit error
46. In the ISO/OSI network stack, packet routing is the responsibility of which layer ?
- (A) Physical Layer
 - (B) Transport Layer
 - (C) Network Layer
 - (D) Session Layer
47. Which one of the following types of networks provides a constant bandwidth for the complete duration of a message transfer ?
- (A) Circuit Switched Network
 - (B) Packet Switched Network
 - (C) Cell Switched Network
 - (D) Virtual Private Network
48. Suppose a complete binary tree has n leaves, what is the total number of nodes in the binary tree ?
- (A) $2n+1$ nodes
 - (B) $\log_2 n$ nodes
 - (C) $2n-1$ nodes
 - (D) n^2 nodes

49. The maximum degree of any vertex in a simple graph with n vertices is
- (A) $n-1$
 - (B) $n+1$
 - (C) $2n-1$
 - (D) n
50. Which of the following data structures is most suitable to check whether an expression contains balanced parentheses ?
- (A) Stack
 - (B) Queue
 - (C) Tree
 - (D) Array
51. What would be the value of x after execution of the following C program segment ?
- ```
x = -5; y = 10;
if (x > y) x = 1;
else if (y < 0) x = (x) * (-1);
else x = 2 * x;
```
- (A) 10
  - (B) -5
  - (C) 1
  - (D) -10
52. Which of the following is NOT indicated by the Cyclomatic complexity measure ?
- (A) Testing complexity
  - (B) Understandability
  - (C) Maintainability
  - (D) Efficiency
53. Which of the following sorting methods would be most suitable for sorting a list that is almost sorted ?
- (A) Bubble Sort
  - (B) Insertion Sort
  - (C) Selection Sort
  - (D) Quick Sort

54. Suppose both the pre-order and post order traversal of a binary tree generate the same output. Then, which of the following can be inferred about the maximum number of nodes in the tree ?
- (A) Three nodes
  - (B) Two nodes
  - (C) One node
  - (D) Any number of nodes
55. The postfix form of  $A*B+C/D$  is
- (A)  $*AB/CD+$
  - (B)  $AB*CD/+$
  - (C)  $A*BC+/D$
  - (D)  $ABCD+/*$
56. Which one of the following properties of an object in an object-oriented program distinguishes it from all other objects ?
- (A) Identity
  - (B) State
  - (C) Behaviour
  - (D) Encapsulation
57. When the following C program segment is executed, how many times will the word "Hello" be displayed ?

```
int i;
for(i=10; i=20; i++)
 printf("Hello\n");
```

- (A) 10 times
  - (B) 11 times
  - (C) 0 times
  - (D) Infinite number of times
58. What would be the value of the variable **a** after the following code segment is executed ?
- ```
int a=7,b=4,c=-2;
a = a - b/ a mod c *a;
```
- (A) 7
 - (B) 9
 - (C) 13
 - (D) 14

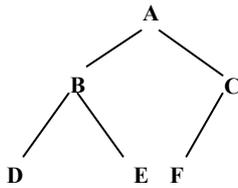
59. A software requirements specification (SRS) document should not discuss which of the following ?
- (A) Functional requirements
 - (B) Non-functional requirements
 - (C) Design specification
 - (D) Constraints on implementation
60. Suppose in a byte addressable computer, FFFF is the last memory location. What is the size of its memory ?
- (A) 1KB
 - (B) 16KB
 - (C) 32KB
 - (D) 64KB
61. Which one of the following types of memories is volatile ?
- (A) Flash memory
 - (B) RAM
 - (C) ROM
 - (D) Magnetic disk
62. The packing of data and functions into a single unit in a program is known as :
- (A) Polymorphism
 - (B) Abstraction
 - (C) Encapsulation
 - (D) Inheritance
63. Consider the statement : “An employee is either a worker or a manager.” What can be inferred about the relation between the employee and manager classes ?
- (A) Association
 - (B) Generalization-specialization
 - (C) Containment
 - (D) Polymorphism
64. A goal of structured programming is to :
- (A) Have well indented programs
 - (B) Be able to infer the flow of control from the compiled code
 - (C) Be able to infer the flow of control from the program text
 - (D) Avoid the use of GOTO statements

65. Which of the following life cycle models lacks the characteristic of iterative software development ?
- (A) Spiral model
 - (B) Prototyping model
 - (C) Classical waterfall model
 - (D) Evolutionary model
66. Which of the following is not a recognized software testing technique ?
- (A) Data-flow testing
 - (B) Path testing
 - (C) Syntax testing
 - (D) Decision testing
67. Verification is :
- (A) Checking that we are building the right system
 - (B) Checking that we are building the system right
 - (C) Performed by an independent test team
 - (D) Making sure that it is what the user really wants
68. If two code segments have Cyclomatic complexities of N_1 and N_2 respectively, what will be the Cyclomatic complexity of the juxtaposition of the two code segments ?
- (A) N_1+N_2
 - (B) N_1+N_2+1
 - (C) N_1+N_2-1
 - (D) N_1*N_2
69. An assembler that runs on one machine, but produces the machine code for another machine is called :
- (A) Simulator
 - (B) Emulator
 - (C) Cross-assembler
 - (D) Compiler
70. Consider the following statement : “A book has one or more pages.” Which of the following best characterizes the relation between book and its pages ?
- (A) Inheritance
 - (B) Composition
 - (C) Association
 - (D) Specialization

71. FTP uses the services of which one of the following protocols ?
- (A) TCP
 - (B) UDP
 - (C) ICMP
 - (D) IGMP
72. Data redundancy is dangerous as it is a potential threat to data :
- (A) Integrity
 - (B) Consistency
 - (C) Sufficiency
 - (D) None of the above
73. If a relation scheme is in BCNF, then it is also in
- (A) First normal form
 - (B) Fourth normal form
 - (C) Fifth normal form
 - (D) None of the above
74. In an inter-network, which of the following functions can a gateway perform, but a hub cannot ?
- (A) Providing connectivity to multiple computers
 - (B) Interconnecting similar networks
 - (C) Interconnecting dissimilar networks
 - (D) Packet routing
75. Which of the following is true of a circuit switched network ?
- (A) Store and forward
 - (B) Explicit circuit establishment and disconnection
 - (C) Datagram-based
 - (D) Broadcast network
76. Which of the following is not a standard image file format ?
- (A) Mpeg
 - (B) Jpeg
 - (C) pdf
 - (D) bmp

77. What will be the output produced when the following “C” program segment is executed ?
- ```
int i=10;
for(; ;)
 printf(“%d, \n” ,++i);
```
- (A) The series 10,11,12,...
- (B) The program will give compilation error
- (C) The series 11,12,13,...
- (D) 10
78. Which of the following transmission media supports the highest data rate ?
- (A) Cat 2
- (B) Optical fibre
- (C) Cat 5
- (D) Coaxial cable
79. How many wire segments are necessary for interconnecting n computers using a hub ?
- (A)  $2*n-1$
- (B) n
- (C)  $2*n+1$
- (D)  $n+1$
80. Which of the following statements is true about an interrupt ?
- (A) It causes an unconditional transfer of control from the executing program.
- (B) It causes conditional transfer of control from the executing program.
- (C) It modifies the status register.
- (D) It is essentially an I/O instruction.
81. The instruction register (IR) stores which one of the following ?
- (A) An instruction that has been decoded
- (B) An instruction that has been fetched from memory
- (C) An instruction that has been executed
- (D) The address of the next instruction to be executed

82. What would be the post-order traversal of the following binary tree ?



- (A) ABCDEF
- (B) ABDECF
- (C) DBEAFC
- (D) DEBFCA

83. Which of the following techniques is used by programming languages such as Java to intercept events that disrupt the normal flow of a program's execution ?

- (A) Code security
- (B) Flow control
- (C) Exception handling
- (D) Error detection

84. A heap is best represented using which of the following data structures ?

- (A) Linked list
- (B) Tree
- (C) Array
- (D) Stack

85. In C language, what does prefixing the unary operator "&" to a variable yield ?

- (A) The variable's value
- (B) The variable's binary form
- (C) The variable's address
- (D) The variable's format

86. Which of the following C statements would interchange the values of the integer variables a and b when executed ?
- (A) a=b; b=a;
  - (B) a=a\*b; b=a/b; a=a/b;
  - (C) a=a+b; b=a-b; a=a-b;
  - (D) a=a+b; b=a-b; a=b-a;
87. What would be the value of i after execution of the following C code segment ?
- ```
int i =1; while (i++ <= 10);
```
- (A) 1
 - (B) 9
 - (C) 10
 - (D) 11
88. Which one of the following C expressions is equivalent to the expression (n != 8) ?
- (A) !(n == 8)
 - (B) (n > 8 && n < 8)
 - (C) (!n == 8)
 - (D) (n == !8)
89. What value does the function **sum** shown below return when called with the parameter value of 5 ?
- ```
int sum (int n) {
 if (n <= 1) return 1;
 else return sum(n - 1) + sum(n - 2);}
```
- (A) 13
  - (B) 10
  - (C) 8
  - (D) 5
90. Which of the following statements is nearest to the meaning of “method overloading” ?
- (A) Two or more methods belong to the same class but have identical code
  - (B) Two or more methods have the same name and parameter types
  - (C) Two or more methods have different names but the same parameter types
  - (D) Two or more methods having the same name but different parameter types

91. What is the worst-case time complexity for finding a single value in an array of integers using serial search ?
- (A) Constant time
  - (B) Logarithmic time
  - (C) Linear time
  - (D) Quadratic time
92. A system call usually causes the invocation of which one of the following ?
- (A) Hardware interrupt
  - (B) Polling
  - (C) Software interrupt
  - (D) Exception
93. A language L is accepted by a finite automaton, if and only if it is :
- (A) Context free
  - (B) Regular
  - (C) Context sensitive
  - (D) Primitive recursive
94. The output of a lexical analyzer is :
- (A) Machine code
  - (B) Intermediate code
  - (C) Parse tree
  - (D) A stream of tokens
95. An atomic test and set instruction is required to implement which one of the following ?
- (A) Semaphore
  - (B) Virtual memory
  - (C) Deadlock
  - (D) Segmentation
96. Zero has two representations in which one of the following encodings ?
- (A) Sign magnitude
  - (B) 1's complement
  - (C) 2's complement
  - (D) ASCII

97. The most suitable data structure that can be used to check whether an arithmetic expression has balanced parentheses is :
- (A) Tree
  - (B) Queue
  - (C) Stack
  - (D) List
98. Transmitted signal becomes weak with distance travelled because of :
- (A) Modulation
  - (B) Induction
  - (C) Switching
  - (D) Attenuation
99. The relative mode of addressing is most relevant to writing which one of the following types of code ?
- (A) Shareable code
  - (B) Position-independent code
  - (C) Interrupt handlers
  - (D) Coroutines
100. Which one of the following statements is false regarding a bridge ?
- (A) Bridge is a layer 2 device
  - (B) Bridge reduces collision domain
  - (C) Bridge is used to connect two or more LAN segments
  - (D) Bridge reduces broadcast domain
101. Merge sort uses which one of the following strategies ?
- (A) Divide and conquer
  - (B) Greedy approach
  - (C) Dynamic programming
  - (D) Branch and bound
102. The principle of locality justifies the use of which of the following ?
- (A) Interrupts
  - (B) DMA
  - (C) Polling
  - (D) Cache memory

103. Which one of the following protocols is used for finding the MAC address corresponding to an IP address ?
- (A) ARP
  - (B) RARP
  - (C) ICMP
  - (D) HDLC
104. In which one of the following page replacement algorithms, Belady's anomaly may occur ?
- (A) Optimal
  - (B) FIFO
  - (C) LRU
  - (D) MRU
105. What is the worst-case time complexity for finding a single item in a sorted array using binary search ?
- (A) Constant time
  - (B) Logarithmic time
  - (C) Linear time
  - (D) Quadratic time
106. Which one of the following is the best definition of a collision in a hash table ?
- (A) Two entries are identical except for their keys.
  - (B) Two entries with different data have exactly the same key.
  - (C) Two entries for which the keys have the same exact hash value.
  - (D) Two entries with exactly same keys have different hash values.
107. If the characters 'D', 'C', 'B', 'A' are inserted (in that order) into a simple queue, and then removed one at a time, in what order will they be removed ?
- (A) ABCD
  - (B) ABDC
  - (C) DCAB
  - (D) DCBA
108. Why is writing easily modifiable code important ?
- (A) Easily modifiable code results in quicker run time.
  - (B) Most real world programs require change at some time.
  - (C) Most text editors make it mandatory to write easily modifiable code.
  - (D) Several people may be writing the same function at the same time.

109. Run-time complexity analysis for a program usually involves counting which of the following ?
- (A) The number of arithmetic and other operations required for the program to run
  - (B) The number of megabytes required for the program to run
  - (C) The number of seconds required for the program to run
  - (D) The number of seconds plus the number of megabytes
110. Suppose one tosses a fair coin three times. What's the probability of obtaining a head on each of the three tosses ?
- (A)  $1/3$
  - (B)  $1/8$
  - (C)  $1/9$
  - (D)  $1/16$
111. Which one of the following is NOT a standard sorting algorithm ?
- (A) Heap
  - (B) Bubble
  - (C) Binary
  - (D) Insertion
112. Which of the following protocols is used in accessing WWW ?
- (A) SNMP
  - (B) SMTP
  - (C) HTTP
  - (D) POP3
113. Why is it important to test boundary values when testing programs ?
- (A) It reduces test costs as boundary values are easily computed by hand.
  - (B) Debugging is easier when testing boundary values.
  - (C) The correct execution of a function on all boundary values proves that a function is correct.
  - (D) In practice, programming the boundary conditions is error prone.
114. Which one of the following software tools is most appropriate to determine whether the designed test cases are fully exercising a piece of code ?
- (A) Dynamic analyzer
  - (B) Static analyzer
  - (C) Parser
  - (D) Profiler

115. Which of the following stack operations could result in stack underflow ?
- (A) is\_empty
  - (B) pop
  - (C) push
  - (D) is\_full
116. When two n bit binary numbers are added, the sum will contain at the most how many bits ?
- (A) n bits
  - (B) n+1 bits
  - (C) n+2 bits
  - (D) n+n bits
117. What is meant by inheritance in the context of object-oriented programming ?
- (A) It is the same as encapsulation.
  - (B) Aggregation of information.
  - (C) Generalization and specialization.
  - (D) Control dependency among classes.
118. SCSI refers to
- (A) Small Computer System Interface
  - (B) Serial Computer System Interface
  - (C) Synchronous Computer System Interface
  - (D) Static Computer Signal Interface
119. How many address lines are needed to address each memory location in a  $2048 \times 4$  memory chip ?
- (A) 8
  - (B) 10
  - (C) 11
  - (D) 12
120. Which one of the following types of memories must be refreshed several times per second to retain data ?
- (A) SRAM
  - (B) DRAM
  - (C) EPROM
  - (D) ROM

**Space For Rough Work**