1. 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

2. A system call usually causes the invocation of which one of the following ?
   (A) Hardware interrupt
   (B) Polling
   (C) Software interrupt
   (D) Exception

3. 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

4. The output of a lexical analyzer is :
   (A) Machine code
   (B) Intermediate code
   (C) Parse tree
   (D) A stream of tokens

5. An atomic test and set instruction is required to implement which one of the following ?
   (A) Semaphore
   (B) Virtual memory
   (C) Deadlock
   (D) Segmentation

6. Zero has two representations in which one of the following encodings ?
   (A) Sign magnitude
   (B) 1's complement
   (C) 2's complement
   (D) ASCII

7. 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

8. Transmitted signal becomes weak with distance travelled because of :
(A) Modulation
(B) Induction
(C) Switching
(D) Attenuation

9. 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

10. 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

11. Merge sort uses which one of the following strategies ?
(A) Divide and conquer
(B) Greedy approach
(C) Dynamic programming
(D) Branch and bound

12. The principle of locality justifies the use of which of the following ?
(A) Interrupts
(B) DMA
(C) Polling
(D) Cache memory

13. 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

14. In which one of the following page replacement algorithms, Belady's anomaly may occur ?
(A) Optimal
(B) FIFO
(C) LRU
(D) MRU

15. 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

16. 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.

17. 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

18. 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.

19. 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

20. 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

21. Which one of the following is NOT a standard sorting algorithm ?
    (A) Heap
    (B) Bubble
    (C) Binary
    (D) Insertion

22. Which of the following protocols is used in accessing WWW ?
    (A) SNMP
    (B) SMTP
    (C) HTTP
    (D) POP3

23. 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.

24. 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

25. Which of the following stack operations could result in stack underflow ?

(A) is_empty

(B) pop

(C) push

(D) is_full

26. 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

27. 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.

28. SCSI refers to

(A) Small Computer System Interface

(B) Serial Computer System Interface

(C) Synchronous Computer System Interface

(D) Static Computer Signal Interface

29. How many address lines are needed to address each memory location in a 2048 × 4 memory chip ?

(A) 8

(B) 10

(C) 11

(D) 12

30. 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

31. 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

32. 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

33. 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

34. 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

35. 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

36. 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

37. In an RDBMS, a tuple is also known as a :

(A) Table

(B) Relation

(C) Row

(D) Field

38. 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.

39. 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

40. 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.

41. In SQL, testing whether a subquery is empty can be done using :

(A) DISTINCT

(B) UNIQUE

(C) NULL

(D) EXISTS

42. 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

43. Which of the following is the result of the "SELECT" SQL command ?

    (A)   TABLE

    (B)   TRIGGER

    (C)   INDEX

    (D)   JOIN

44. A table can have only one :

    (A)   Secondary key

    (B)   Alternate key

    (C)   Foreign key

    (D)   Primary key

45. The operation of eliminating some columns in a table is called

    (A)   select

    (B)   intersect

    (C)   project

    (D)   union

46. 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( )

47. 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

48. The concept of FSA is extensively used in which part in the design of a compiler ?

    (A)   Lexical analyzer

    (B)   Parser

    (C)   Code generater

    (D)   Code optimizer

49. 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

50. 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

51. 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

52. 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

53. A bridge uses which address in handling a host transmission ?
(A) Physical
(B) Network
(C) Transport
(D) Session

54. The worst type of coupling among the modules in a software is
(A) Data coupling
(B) Control coupling
(C) Stamp coupling
(D) Content coupling

55. 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

56. ER model represents which one of the following views ?
(A) Static view
(B) Functional view
(C) Dynamic view
(D) Use case view

57. 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

58. 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

59. 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

60. Which of the following represents the basic unit of data storage in RDBMS ?
(A) Index
(B) Query
(C) Table
(D) None of the above

61. Program development effort is measured in units of :
(A) Person-months (PM)
(B) Rupees (Rs)
(C) Persons (P)
(D) Months (M)

62. 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

63. Among all the phases of the waterfall SDLC, which phase typically consumes the maximum effort ?
(A) Design
(B) Maintenance
(C) Testing
(D) Coding

64. 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}

65. 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.

66. 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

67. Recursive descent parsing is an example of :

(A) Top-down parser

(B) Bottom-up parser

(C) Predictive parser

(D) None of these

68. If A × 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}

69. 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

70. A regular language is produced by

(A) Type I grammar

(B) Type II grammar

(C) Type III grammar

(D) Type 0 grammar

71. 'Cycle Stealing' is associated with which of the following ?

(A) Data transfer among registers

(B) DMA

(C) Pipelining

(D) Microprogramming

72. Among the following types of memories, which one is the fastest ?

(A) Register

(B) Cache

(C) RAM

(D) Hard disk

73. 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

74. What is the binary representation of the unsigned number 12.75 ?
(A) 1100.01
(B) 1010.11
(C) 1100.11
(D) 1010.01

75. 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

76. 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

77. 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

78. 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

79. 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

80. 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

81. 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

82. Which of the following is NOT indicated by the Cyclomatic complexity measure ?

(A) Testing complexity

(B) Understandability

(C) Maintainability

(D) Efficiency

83. 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

84. 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

85. The postfix form of A*B+C/D is
(A) *AB/CD+
(B) AB*CD/+
(C) A*BC+/D
(D) ABCD+/*

86. 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

87. 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

88. 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;
```
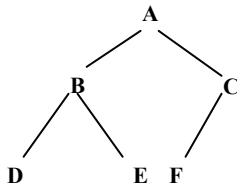(A) 7
(B) 9
(C) 13
(D) 14

89. 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

90. 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

91. Which one of the following types of memories is volatile ?

(A) Flash memory

(B) RAM

(C) ROM

(D) Magnetic disk

92. The packing of data and functions into a single unit in a program is known as :

(A) Polymorphism

(B) Abstraction

(C) Encapsulation

(D) Inheritance

93. 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

94. 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

95. 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

96. Which of the following is not a recognized software testing technique ?
(A) Data-flow testing
(B) Path testing
(C) Syntax testing
(D) Decision testing

97. 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

98. If two code segments have Cyclomatic complexities of N1 and N2 respectively, what will be the Cyclomatic complexity of the juxtaposition of the two code segments ?
(A) N1+N2
(B) N1+N2+1
(C) N1+N2-1
(D) N1*N2

99. 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

100. 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

101. FTP uses the services of which one of the following protocols ?

(A) TCP

(B) UDP

(C) ICMP

(D) IGMP

102. Data redundancy is dangerous as it is a potential threat to data :

(A) Integrity

(B) Consistency

(C) Sufficiency

(D) None of the above

103. 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

104. 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

105. 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

106. Which of the following is not a standard image file format ?

(A) Mpeg

(B) Jpeg

(C) pdf

(D) bmp

107. 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

108. Which of the following transmission media supports the highest data rate ?

(A) Cat 2

(B) Optical fibre

(C) Cat 5

(D) Coaxial cable

109. 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

110. 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.

111. 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

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

(A) ABCDEF

(B) ABDECF

(C) DBEAFC

(D) DEBFCA

113. 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

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

(A) Linked list

(B) Tree

(C) Array

(D) Stack

115. 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

116. 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;

117. 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

118. 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)

119. 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

120. 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

_____

Space For Rough Work