

ENTRANCE EXAMINATION FOR ADMISSION, MAY 2012.

Ph.D. (COMPUTER SCIENCE AND ENGINEERING)

COURSE CODE : 106

Register Number :

*Signature of the Invigilator
(with date)*

COURSE CODE : 106

Time : 2 Hours

Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each of the question carefully and shade the relevant answer (A) or (B) or (C) or (D) or (E) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you -1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

1. A reliable software is one which is
 - (A) Liked by its users
 - (B) Delivered on time and with budget
 - (C) Unlikely to cause failures
 - (D) Very easy to use
 - (E) None of the above

2. Which is not a factor of software quality?
 - (A) Reliability
 - (B) Portability
 - (C) Efficiency
 - (D) Functionality
 - (E) None of the above

3. Which of the following is a reason for a software failure?
 - (A) Testing fault
 - (B) Design fault
 - (C) Requirement fault
 - (D) All of the above
 - (E) None of the above

4. Decision tables are used in situation where
 - (A) An action is initiated on the basis of a varying set of conditions
 - (B) No action is required under a varying set of conditions
 - (C) A number of actions are taken under a varying set of conditions
 - (D) All of the above
 - (E) None of the above

5. Every node of a regular graph has
 - (A) Different degrees
 - (B) Same degree
 - (C) No degree
 - (D) All of the above
 - (E) None of the above

6. Suppose a connected planar graph has 12 regions with each of degree '3', find the number of vertices in the graph
 - (A) 10
 - (B) 15
 - (C) 20
 - (D) 30
 - (E) None of the above

7. Spatial locality refers to the problem that once a location is referenced
 - (A) It will not be referenced again
 - (B) It will be referenced again
 - (C) A nearby location will be referenced soon
 - (D) All of the above
 - (E) None of the above

8. The pure Round-Robin Scheduling policy
- (A) Responds poorly to short processes if the time slice is small
 - (B) Does not use any a priori information about the services times of processes
 - (C) Ensures that the ready queue is always the same size
 - (D) Becomes equivalent to the Shortest Job First policy when the time slice is made infinitely large
 - (E) None of the above
9. The time complexity of the following C function is (assume $n > 0$)
- ```

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

```
- (A)  $O(n)$
  - (B)  $O(n \log_2^n)$
  - (C)  $O(n^2)$
  - (D) All of the above
  - (E) None of the above
10. An undirected graph with  $n$  vertices and edges are represented by adjacency matrix. The time required to determine the degree of any vertex is
- (A)  $O(e)$
  - (B)  $O(n)$
  - (C)  $O(n^2)$
  - (D)  $O(e + n)$
  - (E) None of the above
11. A 48-bit Ethernet address can be used as
- (A) a unicast address
  - (B) a multicast address
  - (C) a broadcast address
  - (D) All of the above
  - (E) None of the above
12. Which one of the following field is not part of TCP header?
- (A) Sequence number field
  - (B) Options
  - (C) Header Checksum
  - (D) Checksum
  - (E) None of the above
13. In which routing method do all the routers have a common database?
- (A) Distance Vector Routing
  - (B) Link State Routing
  - (C) Link Vector Routing
  - (D) All of the above
  - (E) None of the above

14. What are essential properties of Functional Dependencies (FDs)?
- (A) There is a one to one relationship between attributes in FDs
  - (B) FDs must be defined on schema
  - (C) FDs must be non trivial
  - (D) All of the above
  - (E) None of the above
15. Consider the relation  $A \rightarrow FC, C \rightarrow D, B \rightarrow E$ . Find 3NF relations
- (A) AB, BE, AC, CD
  - (B) AB, BE, ACDF
  - (C) AB, BE, ACF, CD
  - (D) All of the above
  - (E) None of the above
16. Which of the following is not efficiently supported by a singly linked list?
- (A) Accessing the element in the current position
  - (B) Insertion after the current position
  - (C) Insertion before the current position
  - (D) All of the above
  - (E) None of the above
17. Which data structures is used to check for balanced parentheses?
- (A) Binary search tree
  - (B) Priority queue
  - (C) Queue
  - (D) Stack
  - (E) None of the above
18. Non-repudiation is
- (A) The receiver's ability to prove that data came from an unauthenticated user
  - (B) The receiver's ability to prove that data is not modified during transit
  - (C) The receiver's ability to prove that data came a specified user
  - (D) All of the above
  - (E) None of the above
19. The primary security requirements do not include
- (A) Reliability
  - (B) Authentication
  - (C) Delivery
  - (D) Performance
  - (E) None of the above

20. Web usability metrics can be divided into
- (i) Page composition metrics
  - (ii) Page formatting metrics
  - (iii) Recovery from failures metrics
  - (iv) Performance verification metrics
- (A) (i) and (iii) (B) (i) and (iv)  
 (C) (i), (iii) and (iv) (D) (i) and (ii)  
 (E) None of the above
21. Which is/are the popular heuristic search technique(s)?
- (A) Hill climbing
  - (B) Simulated annealing
  - (C) Genetic algorithm
  - (D) All of the above
  - (E) None of the above
22. The minterm corresponding to decimal number 13 is
- (A)  $A+B+C'+D$
  - (B)  $A'+B'+C+D'$
  - (C)  $A+B+C+D$
  - (D)  $A'+B'+C'+D'$
  - (E) None of the above
23. How many 128 X 8 RAM chips are needed to provide a memory capacity of 2048 bytes?
- (A) 8
  - (B) 16
  - (C) 32
  - (D) 64
  - (E) None of the above
24. If G is a complete graph on four vertices the G is
- (A) Hamiltonian and Eulerian
  - (B) Neither Hamiltonian nor Eulerian
  - (C) Hamiltonian but not Eulerian
  - (D) Eulerian but not Hamiltonian
  - (E) None of the above
25. Which of the following proposition is a tautology?
- (A)  $(P \cup Q) \rightarrow P$
  - (B)  $P \rightarrow (P \cap Q)$
  - (C)  $P \rightarrow (P \rightarrow Q)$
  - (D)  $Q \rightarrow (P \rightarrow Q)$
  - (E) None of the above
26. A circuit which is working as NAND gate with positive level logic system will work as
- (A) NAND
  - (B) NOR
  - (C) AND
  - (D) OR
  - (E) None of the above

27. The total length of the Pseudo header used in TCP checksum is
- (A) 8 bytes (B) 16 bytes  
(C) 12 bytes (D) 20 bytes  
(E) None of the above
28. A process can be put into a round-robin queue more than once for the purpose of
- (A) Improving CPU utilization (B) Improving response time  
(C) Solving starvation problem (D) Giving it a high priority  
(E) None of the above
29. The number of comparison that is necessary and sufficient for finding both the largest and smallest elements in a set of 'n' elements is
- (A)  $(3n/2) - 2$  (B)  $2n - 2$   
(C)  $4n - 2$  (D) All of the above  
(E) None of the above
30. Which of the following protocols is not locking based protocol?
- (A) 2P (B) Multiple granularity  
(C) Tree protocol (D) Optimistic concurrency control  
(E) None of the above
31. Which of the following scheduler reduces the degree of multiprogramming?
- (A) Long - term scheduler (B) Short - term scheduler  
(C) Mid - term Scheduler (D) All of the above  
(E) None of the above
32. The following items are inserted into an AVL tree: 8, 6, 4, 2, 3. how many rotations are performed?
- (A) No rotations  
(B) 1 single rotation only  
(C) 1 double rotation only  
(D) 1 single rotation and 1 double rotation  
(E) None of the above
33. PSW refers
- (A) Only flags (B) Flags and accumulator  
(C) Only accumulator (D) All of the above  
(E) None of the above

34. Temporal locality of reference can be achieved in cache memory by
- (A) Transferring data as blocks instead of individual words
  - (B) Reducing main memory accesses
  - (C) Placing a copy of data in the cache while it is fetched from main memory
  - (D) Reducing spatial locality
  - (E) None of the above
35. To achieve the maximum performance on a pipelined processor which of the following conditions should be satisfied?
- (A) The latch delay should be zero
  - (B) The amount of data to be processed should be infinite
  - (C) Number of stages should be high
  - (D) All of the above
  - (E) None of the above
36. The complexity of a compiler construction depends on
- (A) Source programming language
  - (B) Target machine language
  - (C) Instruction set of source machine
  - (D) All of the above
  - (E) None of the above
37. Given a system with 'n' processes, how many possible ways can those processes be scheduled?
- (A)  $n^2$
  - (B) n
  - (C) 2n
  - (D) n!
  - (E) None of the above
38. What is the output of the following program?
- ```
#define square(x) x*x
main()
{
int i;
i = 64 / square (4);
printf("%d", i);
}
```
- (A) 4
 - (B) 64
 - (C) 1
 - (D) 2
 - (E) None of the above
39. In DNS, the client could directly contact more than one server is known as
- (A) A recursive resolution
 - (B) An iterative resolution
 - (C) A Cache resolution
 - (D) All of the above
 - (E) None of the above

40. Which of the following flip flop is more suitable for implement NOMODIAL counter?
- (A) T-FF (B) SR-FF
 (C) D-FF (D) Both (A) & (B)
 (E) None of the above
41. Which of the following cache gives better performance?
- (A) 256 KB 4-way set associate (B) 16 KB 4-way set associate
 (C) 256 KB 8-way set associate (D) 16 KB 8-way set associate
 (E) None of the above
42. The minimal finite automata accepting the set denoted by $(0+1)^* (00+11)$ has
- (A) 3 states (B) 4 states
 (C) 5 states (D) 6 states
 (E) None of the above
43. The chromatic number of a star graph with 'n' vertices is
- (A) 2 (B) 4
 (C) $n - 1$ (D) $n / 2$
 (E) None of the above
44. Mutation testing is related to
- (A) Fault seeding (B) Fault severity
 (C) Fault impact analysis (D) All of the above
 (E) None of the above
45. If there are 64 segments and each of size 2 KB, then the logical address should have
- (A) 14 bits (B) 15 bits
 (C) 16 bits (D) 17 bits
 (E) None of the above
46. What can static analysis not identify?
- (A) Memory leaks
 (B) Data of defined variables but which are not used
 (C) Data of variables used but not defined
 (D) Array bound violations
 (E) None of the above

47. Which of the following is not achieved by regression testing?
- (A) Locate errors in the modified program
 - (B) Increase confidence in the correctness of the modified program
 - (C) Ensure the continued operation of the program
 - (D) Increase the functionality of the program
 - (E) None of the above
48. Choose the most desirable type of coupling
- (A) Data coupling
 - (B) Stamp coupling
 - (C) Control coupling
 - (D) Common coupling
 - (E) None of the above
49. The simplest form of $(p \wedge q) \vee (\sim((\sim p) \vee q))$ is
- (A) p
 - (B) q
 - (C) $\sim p$
 - (D) $\sim q$
 - (E) None of the above
50. _____ is an extension of the ideas suggested by the use of relocation limit registers for relocating and bound checking blocks of memory.
- (A) Segmentation
 - (B) Paging
 - (C) Partitioning
 - (D) Overlaying
 - (E) None of the above
51. A wait operation on a semaphore should not occur within a critical section controller by that semaphore because
- (A) A deadlock will occur
 - (B) A semaphore is not a shared variable
 - (C) Another process may then enter the critical section violating the mutual exclusion concept
 - (D) A signal on semaphore is always given from outside the critical section
 - (E) None of the above
52. Which of the following is a dangling reference?
- (A) Accessing a storage that is already disposed at the request of the user
 - (B) Accessing a storage that is already disposed at the request of the processor
 - (C) Accessing a variable that is declared but not initialized
 - (D) All of the above
 - (E) None of the above

53. Which of the following is correct?
- (A) A heap is always a binary search trees
 - (B) A binary search tree is always a heap
 - (C) A heap is always a complete binary tree
 - (D) A complete binary tree is always a heap
 - (E) None of the above
54. Which of the following data structures will allow merge sort to work in $\theta(n \log n)$ time?
- I. An array II. Singly Linked List III. Doubly Linked List
- (A) I only
 - (B) I and II only
 - (C) II and III only
 - (D) I, II and III
 - (E) None of the above
55. Type of Service (TOS) field is used in one of the following layers
- (A) Network Layer
 - (B) Transport Layer
 - (C) Data Link Layer
 - (D) All of the above
 - (E) None of the above
56. "Hot Potato" is an example of the following routing algorithms
- (A) Centralized Routing
 - (B) Isolated Routing
 - (C) Distributed Routing
 - (D) All of the above
 - (E) None of the above
57. Selective Reject ARQ is _____ Error Control method.
- (A) Stop-and-Wait ARQ
 - (B) Sliding Window ARQ
 - (C) Go-Back-n ARQ
 - (D) All of the above
 - (E) None of the above
58. An Ethernet LAN uses _____ signals.
- (A) Manchester encoded
 - (B) PSK
 - (C) Differential PSK
 - (D) All of the above
 - (E) None of the above
59. In Token Ring, the AC field contains _____ information.
- (A) Priority
 - (B) Frame type
 - (C) Reservation
 - (D) All of the above
 - (E) None of the above

60. The dual of Boolean theorem $x(y+z) = xy + xz$ is
- (A) $x+yz = xy + xz$ (B) $x(y+z) = (x+y)(x+z)$
 (C) $x+yz = (x+y)(x+z)$ (D) All of the above
 (E) None of the above
61. The number of full adders and half adders required to construct 4-bit binary parallel adder
- (A) Three full adders and one half adder
 (B) Two full adders and one half adder
 (C) Three half adders and one full adder
 (D) Two half adders and two full adders
 (E) None of the above
62. The minimum of flip flop required for a Mod-10 counter are
- (A) 4 (B) 2
 (C) 10 (D) 5
 (E) None of the above
63. Race condition occurs in
- (A) Synchronous circuit (B) Asynchronous circuit
 (C) Combinational circuit (D) All of the above
 (E) None of the above
64. The only interrupt that is edge-triggered is
- (A) INTR (B) TRAP
 (C) RST 7.5 (D) RST 5.5
 (E) None of the above
65. Von Neumann architecture is
- (A) SISD (B) SIMD
 (C) MIMD (D) MISD
 (E) None of the above
66. A program that transfers itself from computer to computer over a network and plant itself as a separate file is called as
- (A) Spider (B) Trojan horse
 (C) Macro virus (D) Worm
 (E) None of the above

67. Data security threats include
- (A) Hardware failure (B) Fraudulent manipulation of data
 (C) Privacy invasion (D) All of the above
 (E) None of the above
68. Associative memory is a
- (A) Pointer addressable memory (B) Very cheap memory
 (C) Content addressable memory (D) All of the above
 (E) None of the above
69. The memory address of fifth element of an array can be calculated by the formula
- (A) $LOC(\text{Array}[5]) = \text{Base}(\text{Array}) + w(5 - \text{lower bound})$, where w is the number of words per memory cell for the array
 (B) $LOC(\text{Array}[5]) = \text{Base}(\text{Array}[5]) + (5 - \text{lower bound})$, where w is the number of words per memory cell for the array
 (C) $LOC(\text{Array}[5]) = \text{Base}(\text{Array}[4]) + (5 - \text{Upper bound})$, where w is the number of words per memory cell for the array
 (D) All of the above
 (E) None of the above
70. Which of the following is not the required condition for binary search algorithm?
- (A) The list must be sorted
 (B) There should be the direct access to the middle element in any sublist
 (C) There must be mechanism to delete and/or insert elements in list
 (D) All of the above
 (E) None of the above
71. Which of the following is not a limitation of binary search algorithm?
- (A) Requirement of sorted array is expensive when a lot of insertion and deletions are needed
 (B) There must be a mechanism to access middle element directly
 (C) Binary search algorithm is not efficient when the data elements are more than 1000
 (D) All of the above
 (E) None of the above
72. The difference between linear array and a record is
- (A) An array is suitable for homogeneous data but the data items in a record may have different data type
 (B) In a record, there may not be a natural ordering in opposed to linear array.
 (C) A record form a hierarchical structure but a linear array does not
 (D) All of the above
 (E) None of the above

73. Binary search algorithm cannot be applied to
- (A) sorted linked list (B) sorted binary trees
 (C) sorted linear array (D) all of the above
 (E) none of the above
74. When in-order traversing a tree resulted E A C K F H D B G; the preorder traversal would return
- (A) FAEKCDHBG (B) FAEKCDHGB
 (C) EAFKHDCBG (D) All of the above
 (E) None of the above
75. The time factor when determining the efficiency of algorithm is measured by
- (A) Counting microseconds
 (B) Counting the number of key operations
 (C) Counting the number of statements
 (D) All of the above
 (E) None of the above
76. The complexity of merge sort algorithm is
- (A) $O(n)$ (B) $O(\log n)$
 (C) $O(n \log n)$ (D) All of the above
 (E) None of the above
77. Identify the data structure which allows deletions at both ends of the list but insertion at only one end.
- (A) Input-restricted deque (B) Output-restricted deque
 (C) Priority queues (D) All of the above
 (E) None of the above
78. The depth of a complete binary tree is given by
- (A) $D_n = n \log_2 n$ (B) $D_n = n \log_2 n + 1$
 (C) $D_n = \log_2 n + 1$ (D) All of the above
 (E) None of the above
79. When representing any algebraic expression E which uses only binary operations in a 2-tree,
- (A) the variable in E will appear as external nodes and operations in internal nodes
 (B) the operations in E will appear as external nodes and variables in internal nodes
 (C) the variables and operations in E will appear only in internal nodes
 (D) all of the above
 (E) none of the above

80. In a binary tree, certain null entries are replaced by special pointers which point to nodes higher in the tree for efficiency. These special pointers are called
 (A) leaf (B) branch
 (C) thread (D) all of the above
 (E) none of the above
81. In a Heap tree
 (A) Values in a node is greater than every value in left sub tree and smaller than right sub Tree
 (B) Values in a node is greater than every value in children of it
 (C) Both of above conditions applies
 (D) All of the above
 (E) None of the above
82. In a graph if $e = [u, v]$, Then u and v are called
 (A) endpoints of e (B) adjacent nodes
 (C) neighbors (D) all of the above
 (E) none of the above
83. The data recording format in most of the modern magnetic tape is
 (A) 7-bit EBCDIC (B) 8-bit ASCII
 (C) 8-bit EBCDIC (D) All of the above
 (E) None of the above
84. Storage capacity of magnetic disk depends on
 (A) tracks per inch of surface (B) bits per inch of tracks
 (C) disk pack in disk surface (D) All of the above
 (E) None of the above
85. Which is the limitation of high level language?
 (A) Lower efficiency (B) Machine dependence
 (C) Machine level coding (D) All of the above
 (E) None of the above
86. The octal equivalent of 111010 is
 (A) 81 (B) 72
 (C) 71 (D) All of the above
 (E) None of the above
87. The process of starting a or restarting a computer system by loading instructions from a secondary storage device into the computer memory is called
 (A) Duping (B) Booting
 (C) Padding (D) All of the above
 (E) None of the above

88. Which of the following file organization is most efficient for a file with a high degree of file activity?
- (A) Sequential
 - (B) ISAM
 - (C) VSAM
 - (D) All of the above
 - (E) None of the above
89. In OSI network architecture, the dialogue control and token management are responsibility of
- (A) session layer
 - (B) network layer
 - (C) transport layer
 - (D) all of the above
 - (E) none of the above
90. How many OSI layers are covered in the X.25 standard?
- (A) Two
 - (B) Three
 - (C) Seven
 - (D) All of the above
 - (E) None of the above
91. In case of pass by reference
- (A) The values of those variables are passed to the function so that it can manipulate them
 - (B) The location of variable in memory is passed to the function so that it can use the same memory area for its processing
 - (C) The function declaration should contain ampersand (&) in its type declaration
 - (D) All of the above
 - (E) None of the above
92. What is the bit size of 6800 microprocessor?
- (A) 8 bit
 - (B) 4 bit
 - (C) 16 bit
 - (D) 6 bit
 - (E) 32 bit
93. Which of the following is an advantage of NTFS over FAT?
- (A) It permits the server to be used as both server and work- station.
 - (B) It alleviates the need for data backups.
 - (C) It utilizes the disk space far more efficiently than FAT.
 - (D) It directly accesses the system hardware.
 - (E) All of the above
94. Name of the rendering engine used in FireFox browser is
- (A) Mozilla
 - (B) DrawFox
 - (C) Gecko
 - (D) Kecro
 - (E) None of the above

95. The most powerful parsing method is
- (A) LL(1) (B) Canonical LR
 (C) SLR (D) LALR
 (E) None of the above
96. "Data Redundancy"
- (A) is a problem with traditional file systems
 (B) is reduced by normalization
 (C) can lead to data inconsistency
 (D) all the above
 (E) none of the above
97. What is the max number of edges an undirected graph with N nodes can have?
- (A) N (B) $\log N$
 (C) N^2 (D) $2N$
 (E) None of the above
98. The postfix equivalent of the expression $((A + B) * C - (D - E) ^ (F + G))$ is
- (A) $AB + C * DE - - FG + ^$ (B) $AB C + * DE - - FG + ^$
 (C) $AB + C * DE - FG - ^ +$ (D) $AB C + * - DE - FG + ^$
 (E) None of the above
99. RAID implies
- (A) disks operated in parallel
 (B) mechanism for ensuring reliability
 (C) independent read and writes
 (D) all of the above
 (E) none of the above
100. With dynamic address relocation, the relocation register contains
- (A) The physical address of the first address in the address space
 (B) The virtual address issued by the CPU
 (C) The linear offset into the address space
 (D) The size of the address space
 (E) None of the above