

**ENTRANCE TEST-2024****2-Year M Tech Programme  
Computer Science Engineering**

Total Questions : 60

Time Allowed : 70 Minutes

Roll No.

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1. Write your roll number in the space provided at the top of this page of question booklet and fill up the necessary information in the spaces provided on OMR Answer sheet.
2. OMR Answer sheet has an original copy and a candidate's copy glued beneath it at the top. While making entries in the original copy, candidate should ensure that the two copies are aligned properly so that the entries made in the original copy against each item are exactly copied in the candidate's copy.
3. All entries in the OMR answers sheet including answers to questions are to be recorded in the original/Carbon copy.
4. Use only blue/ black ball point pen to darken the circle of correct / most appropriate response. In no case gel/ ink pen or pencil should be used.
5. Do not darken more the one circle of option for any question. A question with more than one darkened response shall be considered wrong.
6. There will be negative marking for wrong answers. Each wrong answer will lead to the deduction of 0.25 marks from the total score of the candidate.
7. Only those candidates who would obtain positive score in entrance test examination shall be eligible for admission.
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9. Calculators and mobiles shall not be permitted inside the examination hall.
10. Rough work, if any, should be done on the blank sheets provided with the question booklet.
11. OMR answer sheet must be handled carefully and it should not be folded or mutilated in such case it will not be evaluated.
12. Ensure that your OMR Answer sheet has been signed by the invigilator and the candidate himself/herself.
13. At the end of the examination hand over the OMR answer sheet to the invigilator who will first tear off the original OMR sheet in presence of the candidate and hand over the candidate's copy to the candidate.
14. If any of the information in the response Sheet/Question Paper has been found missing or not mentioned as stated above the candidate is solely responsible for that lapse.

SEAL



**M.Tech {Computer Science Engineering }**

- 2401
1. The price of a commodity increases by 10% every year. If the current price is ₹1000, what will be its price after 2 years?
    - a) ₹1200
    - b) ₹1210
    - c) ₹1230
    - d) ₹1260
  2. The ratio of the ages of two persons is 4:5, and the sum of their ages is 45 years. What is the age of the younger person?
    - a) 13 years
    - b) 20 years
    - c) 24 years
    - d) 18 years
  3. In a partially ordered set (poset), if every pair of elements has a least upper bound, then the poset is called a?
    - a) Lattice
    - b) Chain
    - c) Total order
    - d) Forest
  4. Which of the following is a cyclic group?
    - a) The set of all integers under addition
    - b) The set of non-zero real numbers under multiplication
    - c) The set of all  $2 \times 2$  invertible matrices under matrix multiplication
    - d) The set of all positive integers under multiplication
  5. Which of the following relations is an example of a reflexive relation on the set  $\{1,2,3\}$ ?
    - a)  $\{(1,2), (2,3), (3,1)\}$
    - b)  $\{(1,1), (2,2), (3,3)\}$
    - c)  $\{(1,2), (2,3)\}$
    - d)  $\{(1,2), (1,1), (2,2)\}$
  6. For the recurrence relation  $T(n) = 2T(n/2)$ , what is the time complexity using the Master Theorem?
    - a)  $O(n)$
    - b)  $O(n \log n)$
    - c)  $O(n^2)$
    - d)  $O(\log n)$



7. A graph is said to be bipartite if:
- It contains no cycles.
  - It contains no odd-length cycles.
  - It contains exactly one cycle.
  - It contains at least one cycle.
8. Which of the following is a characteristic of an Eulerian graph?
- Every vertex has an even degree.
  - Every vertex has an odd degree.
  - The graph must be bipartite.
  - The graph must be a tree.
9. In a digital system, what does a shift-left operation do to the binary data?
- It multiplies the binary number by 2
  - It divides the binary number by 2
  - It rotates the binary number
  - It adds a binary number to itself
10. In Quine-McCluskey method, if two minterms differ by only one bit, they will form a:
- Prime implicant
  - Essential prime implicant
  - Composite implicant
  - Don't-care condition
11. If a function has minterms 0, 1, 2, 4, 5, 6, and 7, what is the number of prime implicants needed to cover these minterms?
- 3
  - 4
  - 5
  - 6
12. Which of the following is a characteristic of an XOR gate?
- It outputs high when both inputs are the same.
  - It outputs high when exactly one input is high.
  - It outputs low when one input is high.
  - It is the same as an OR gate.
13. What is the primary advantage of using Direct Memory Access (DMA) over programmed I/O?
- Reduced CPU intervention
  - Increased CPU load
  - Simplified hardware design
  - Higher data transfer rates



14. What does the term "polling" refer to in programmed I/O?
- a) CPU waiting for an interrupt signal
  - b) CPU periodically checking the status of an I/O device
  - c) DMA controller managing data transfers
  - d) Memory mapping I/O operations
15. In a 5-stage pipeline with stages IF, ID, EX, MEM, and WB, which hazard is resolved by introducing a bubble (NOP) into the pipeline?
- a) Data hazard
  - b) Control hazard
  - c) Structural hazard
  - d) Cache miss
16. In a pipelined CPU with a branch prediction mechanism, what happens if a branch is mispredicted?
- a) The pipeline continues without interruption
  - b) The pipeline is flushed and restarted
  - c) The instructions are re-fetched
  - d) The mispredicted instruction is corrected automatically
17. In a 6-stage pipeline, if an instruction requires data from a previous instruction which is in the MEM stage, how many cycles are required to resolve the data hazard using forwarding?
- a) 1 cycle
  - b) 2 cycles
  - c) 3 cycles
  - d) 4 cycles
18. Given a singly linked list, what is the time complexity of finding the middle node if you are allowed to traverse the list only once?
- a)  $O(1)$
  - b)  $O(\log n)$
  - c)  $O(n)$
  - d)  $O(n \log n)$
19. In a doubly linked list, how do you insert a node between two existing nodes?
- a) Update the next and previous pointers of the new node and the adjacent nodes.
  - b) Only update next pointer of the previous node and previous pointer of the next node.
  - c) Only update the next pointer of the new node.
  - d) Only update the previous pointer of the new node.



20. In a stack, what is the effect of performing push() and pop() operations consecutively?

- a) The stack remains unchanged
- b) The stack grows by one element
- c) The stack shrinks by one element
- d) The stack is emptied

21. What is the value of the expression sizeof('A') + sizeof(3.14f) in a C program?

- a) 5
- b) 8
- c) 9
- d) 10

22. What is the output of the following C code?

```
int main()
{
    int a = 5, b = 10, c;
    c = (a < b) ? (b - a) : (a - b);
    printf("%d", c);
    return 0;
}
```

- a) a) 5
- b) b) -5
- c) c) 0
- d) d) 10

23. Which of the following is true about bucket sort?

- a) It's a comparison-based sort.
- b) It has a time complexity of  $O(n \log n)$ .
- c) It's an unstable sort.
- d) It assumes uniform distribution of elements.

24. Which of the following has the largest growth rate as  $n$  increases?

- a)  $O(n)$
- b)  $O(n \log n)$
- c)  $O(n^2)$
- d)  $O(2^n)$

25. In Big-O notation, the time complexity of the function  $f(n) = 3n^3 + 5n^2 + 10n + 7$  is:

- a)  $O(n^2)$
- b)  $O(n^3)$
- c)  $O(n \log n)$
- d)  $O(1)$



26. Which of the following problems is typically solved using a greedy algorithm?

- a) Longest Common Subsequence
- b) Maximum Flow
- c) Fractional Knapsack
- d) Travelling Salesman Problem

27. What is the time complexity of Prim's algorithm when using a Fibonacci heap?

- a)  $O(V^2)$
- b)  $O(E \log V)$
- c)  $O(V \log V)$
- d)  $O(E + V \log V)$

28. The time complexity of the Floyd-Warshall algorithm is:

- a)  $O(V + E)$
- b)  $O(V^2)$
- c)  $O(V^2 \log V)$
- d)  $O(V^3)$

29. Which of the following is a property of Dijkstra's shortest path algorithm?

- a) It can handle negative edge weights.
- b) It requires the graph to be acyclic.
- c) It uses a priority queue.
- d) It finds the shortest path for all pairs of vertices.

30. Which of the following is NOT a characteristic of a minimum spanning tree?

- a) It spans all vertices of the graph.
- b) It has the smallest possible number of edges.
- c) It has the minimum total edge weight.
- d) It must be connected.

31. If  $f(n) = O(g(n))$  and  $g(n) = O(h(n))$ , which of the following is true?

- a)  $h(n) = O(f(n))$
- b)  $f(n) = O(h(n))$
- c)  $g(n) = O(f(n))$
- d)  $h(n) = O(g(n))$

32. For a function  $f(n) = 2n + 3 \log n + 5$ , the time complexity is:

- a)  $O(n \log n)$
- b)  $O(n)$
- c)  $O(\log n)$
- d)  $O(n^2)$



33. Which of the following is true for regular languages?
- a) Closed under union
  - b) Closed under intersection
  - c) Closed under complement
  - d) All of the above
34. Which of the following grammars is context-free?
- a)  $S \rightarrow aS|bS|$
  - b)  $S \rightarrow aSbSa|\epsilon$
  - c)  $S \rightarrow aSb|SS|\epsilon$
  - d) All of the above
35. Which of the following is true for a regular language L?
- a) It satisfies the Pumping Lemma
  - b) It does not satisfy the Pumping Lemma
  - c) It can be accepted by a Pushdown Automaton
  - d) It can be accepted by a Turing Machine
36. Which of the following languages is recursively enumerable but not recursive?
- a) The language of all palindromes over  $\{a, b\}$
  - b) The language of all binary strings that do not contain '11'
  - c) The language of all Turing Machines that halt on the empty input
  - d) The language of all strings over  $\{a, b\}$  that contain an equal number of a's and b's.
37. What is the minimum number of states required in a PDA to accept the language  $\{w \in \{a, b\}^* | w \text{ has equal number of a's and b's}\}$ ?
- a) 1
  - b) 2
  - c) 3
  - d) 4
38. How many states does a minimal deterministic finite automaton (DFA) recognizing the language defined by the regular expression  $(a|b)^2$  have?
- a) 1
  - b) 2
  - c) 3
  - d) 4



39. A lexeme in a source program is matched by the lexical analyzer as a \_\_\_\_\_.

- a) Token
- b) Pattern
- c) String
- d) Code

40. Which phase of the compiler is responsible for the removal of white spaces and comments?

- a) Lexical Analysis
- b) Syntax Analysis
- c) Semantic Analysis
- d) Code Generation

41. Which of the following grammars is used by most parsing algorithms?

- a) Regular grammar
- b) Context-free grammar
- c) Context-sensitive grammar
- d) Unrestricted grammar

42. Which of the following is a top-down parser without backtracking?

- a) SLR parser
- b) LR parser
- c) LL parser
- d) Recursive descent parser

43. Which type of attribute depends on its parent node in the parse tree?

- a) Inherited attribute
- b) Synthesized attribute
- c) Derived attribute
- d) None of the above

44. Which method of handling deadlocks involves recovering from a deadlock by aborting processes?

- a) Deadlock Prevention
- b) Deadlock Avoidance
- c) Deadlock Detection and Recovery
- d) Resource Allocation



45. What is a "race condition" in concurrent programming?
- a) A situation where two or more processes attempt to change shared data simultaneously
  - b) A situation where processes are waiting for each other to complete
  - c) A situation where a process is waiting indefinitely for a resource
  - d) A situation where processes execute in a non-deterministic order
46. If there are 5 processes and 3 resource types with instances (7, 5, 3), determine the safe sequence if the need matrix is (3,2,2), (2,1,1), (0,0,0), (4,2,2), (1,1,1) and allocation matrix is (0,1,0), (2,0,0), (3,0,3), (2,1,1), (0,0,2).
- a) P1, P3, P4, P5, P2
  - b) P3, P4, P2, P1, P5
  - c) P3, P5, P4, P1, P2
  - d) P2, P1, P3, P4, P5
47. In a system using Round-Robin scheduling with a time quantum of 10 ms, if a process requires 25 ms of CPU time, how many context switches will occur for this process?
- a) 2
  - b) 3
  - c) 4
  - d) 1
48. If a system uses 32-bit addresses with a 4 KB page size, how many bits are used for the page offset?
- a) 10 bits
  - b) 12 bits
  - c) 14 bits
  - d) 16 bits
49. Consider a system where a system call takes 10 ms to execute. A process makes 50 system calls. If the CPU is 80% utilized, how much time will be spent in system calls?
- a) 0.5 seconds
  - b) 0.4 seconds
  - c) 0.6 seconds
  - d) 0.8 seconds
50. What is the purpose of a locking protocol in database systems?
- a) To manage the concurrency of transactions and prevent conflicts
  - b) To ensure data integrity by enforcing referential constraints
  - c) To optimize query execution plans
  - d) To handle data replication and backup



51. Given a relation  $R(A, B, C, D, E)$ , with FDs  $\{A \rightarrow B, C \rightarrow D\}$ , which is the highest normal form the relation  $R$  can achieve without losing data?
- a) 1NF
  - b) 2NF
  - c) 3NF
  - d) BCNF
52. If a relation is in 2NF and has 5 attributes, what is the maximum number of candidate keys possible?
- a) 2
  - b) 3
  - c) 4
  - d) 5
53. Which SQL statement is used to retrieve all columns from the table Employees where the Salary is greater than 50000?
- a) `SELECT * FROM Employees WHERE Salary > 50000;`
  - b) `SELECT Salary FROM Employees WHERE Salary > 50000;`
  - c) `GET * FROM Employees WHERE Salary > 50000;`
  - d) `FETCH * FROM Employees WHERE Salary > 50000;`
54. Which of the following is true about a B+ tree compared to a B-tree?
- a) All values are stored in the internal nodes of a B+ tree.
  - b) B+ trees are less balanced than B-trees.
  - c) B+ trees have all values stored at the leaf level, which makes range queries more efficient.
  - d) B+ trees do not require the leaf nodes to be linked.
55. In Ethernet bridging, which address is used to make forwarding decisions?
- a) IP address
  - b) MAC address
  - c) Port number
  - d) Subnet mask
56. What happens when a packet size exceeds the MTU (Maximum Transmission Unit)?
- a) The packet is dropped.
  - b) The packet is fragmented.
  - c) The packet is routed via a different path.
  - d) An error message is sent to the sender.



57. CIDR notation 192.168.1.0/24 represents which of the following?

- a) Subnet mask 255.255.255.0
- b) Subnet mask 255.255.255.128
- c) Subnet mask 255.255.255.192
- d) Subnet mask 255.255.255.224

58. If an IPv4 address is 192.168.10.25/28, how many hosts can be addressed in this subnet?

- a) 4
- b) 8
- c) 14
- d) 16

59. Which IP address range is reserved for multicast addresses?

- a) 224.0.0.0 to 239.255.255.255
- b) 240.0.0.0 to 255.255.255.255
- c) 192.168.0.0 to 192.168.255.255
- d) 169.254.0.0 to 169.254.255.255

60. Which of the following is NOT a characteristic of a socket?

- a) IP address
- b) Port number
- c) Protocol (TCP/UDP)
- d) MAC address

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# ENTRANCE TEST-2019

609

## SCHOOL OF APPLIED SCIENCES AND TECHNOLOGY M.TECH. IN COMPUTER SCIENCES

Total Questions : 60

Question Booklet Series

A

Time Allowed : 70 Minutes

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### Instructions for Candidates:

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Q1. Synonym of abdicate is

- (A) Join
- (B) Search
- (C) Abandon
- (D) Advance

Q2. Oneword substitution for agnostic is

- (A) one who is not sure about God's existence.
- (B) one who believes in God's existence.
- (C) one having different style of living.
- (D) none of above.

Q3. In a chess tournament each of six players will play every other player exactly once. How many matches will be played during the tournament?

- (A) 12
- (B) 15
- (C) 30
- (D) 36

Q4. P, Q, R and S play a game of cards. P says to Q, "If I give you 8 cards, you will have as many as R has and I shall have 3 less than what R has. Also if I take 6 cards from R, I shall have twice as many as S has." If Q and S together have 50 cards, how many cards have P got?

- (A) 35
- (B) 37
- (C) 38
- (D) 40

Q5. Find the HCF of  $55 \times 35 \times 180$ ,  $2 \times 36 \times 7$

- (A) 128
- (B) 252
- (C) 146
- (D) 434

Q6. How many terms are there in 2, 4, 8, 16, ..... 1024

- (A) 7
- (B) 8
- (C) 9
- (D) 10

Q7. Find the number, when 15 is subtracted from 7 times the number, the result is 10 more than twice of the number

- (A) 5
- (B) 15
- (C) 7.5
- (D) 4

Q8. Sum of a rational number and its reciprocal is  $13/6$ . Find the number

- (A) 2
- (B)  $3/2$
- (C)  $4/2$
- (D)  $5/2$



Q9. Which of the following is tautology:

- (A)  $(a \vee b) \rightarrow (b \wedge c)$
- (B)  $(a \wedge b) \rightarrow (b \vee c)$
- (C)  $(a \vee b) \rightarrow (b \rightarrow c)$
- (D)  $(a \rightarrow b) \rightarrow (b \rightarrow c)$

Q10. The proposition  $p \wedge (\sim p \vee q)$  is

- (A) a tautology
- (B)  $\Leftrightarrow (p \wedge q)$
- (C)  $\Leftrightarrow (p \vee q)$
- (D) a contradiction

Q11. Which one of the following is false? Read  $\wedge$  as AND,  $\vee$  as OR,  $\sim$  as NOT,  $\rightarrow$  as one way implication and  $\leftrightarrow$  as two way implication.

- (A)  $((x \rightarrow y) \wedge x) \rightarrow y$
- (B)  $((\sim x \rightarrow y) \wedge (\sim x \rightarrow \sim y)) \rightarrow x$
- (C)  $(x \rightarrow (x \vee y))$
- (D)  $((x \vee y) \leftrightarrow (\sim x \rightarrow \sim y))$

Q12. What is the logical translation of the following statements?

"None of my friends are perfect"

- (A)  $\exists x (F(x) \wedge \neg P(x))$
- (B)  $\exists x (\neg F(x) \wedge P(x))$
- (C)  $\exists x (\neg F(x) \wedge \neg P(x))$
- (D)  $\neg \exists x (F(x) \wedge P(x))$

Q13. If a, b and c are constants, which of the following is a linear inequality?

- (A)  $ax + bcy = 0$
- (B)  $ax^2 + cy = 21$
- (C)  $abx + a^2y \geq 15$
- (D)  $xy + ax \geq 20$

Q14. A square matrix is singular whenever:

- (A) The rows are linearly independent
- (B) The columns are linearly independent
- (C) The rows are linearly dependent
- (D) None of the above

Q15. If A and B are real symmetric matrices of size  $n \times n$ . Then, which one of the following is true?

- (A)  $AA^T = I$
- (B)  $A = A^{-1}$
- (C)  $AB = BA$
- (D)  $(AB)^T = BA$

Q16. The determinant of the following matrix is:

$$\begin{bmatrix} 6 & -8 & 1 & 1 \\ 0 & 2 & 4 & 6 \\ 0 & 0 & 4 & 8 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

- (A) 11
- (B) -48
- (C) 0
- (D) -24



Q17. If at every point of a certain curve, the slope of the tangent equals  $(-2x/y)$  the curve is  
(A) A straight line  
(B) A parabola  
(C) A circle  
(D) An ellipse

Q18. The formula used to compute an approximation for the second derivative of a function  $f$  at a point  $x_0$  is

- (A)  $\frac{f(x_0+h)+f(x_0-h)}{2}$   
(B)  $\frac{f(x_0+h)-f(x_0-h)}{2h}$   
(C)  $\frac{f(x_0+h)+2f(x_0)+f(x_0-h)}{h^2}$   
(D)  $\frac{f(x_0+h)-2f(x_0)+f(x_0-h)}{h^2}$

Q19. What is the maximum value of the function  $f(x) = 2x^2 - 2x + 6$  in the interval  $[0, 2]$ ?

- (A) 6  
(B) 10  
(C) 12  
(D) 5.5

Q20. Consider the function  $y = |x|$  in the interval  $(-1, 1)$ . In this interval, the function is

- (A) continuous and differentiable  
(B) continuous but not differentiable  
(C) differentiable but not continuous  
(D) neither continuous nor differentiable

Q21. A bag contains 10 white balls and 15 black balls. Two balls are drawn in succession. The probability that one of them is black and the other is white is

- (A)  $2/3$   
(B)  $4/5$   
(C)  $1/2$   
(D)  $1/3$

Q22. Two dice are thrown simultaneously. The probability that at least one of them will have 6 facing up is

- (A)  $1/36$   
(B)  $1/3$   
(C)  $25/36$   
(D)  $11/36$

Q23. The probability that top and bottom cards of a randomly shuffled deck are both aces is

- (A)  $(4 \times 4)/(52 \times 52)$   
(B)  $(4 \times 3)/(52 \times 52)$   
(C)  $(4 \times 3)/(52 \times 51)$   
(D)  $(4 \times 4)/(52 \times 51)$

Q24. The probability that it will rain today is 0.5. The probability that it will rain tomorrow is 0.6. The probability that it will rain either today or tomorrow is 0.7. What is the probability that it will rain today or tomorrow?

- (A) 0.3  
(B) 0.25  
(C) 0.35  
(D) 0.4



Q25. Let \* be defined as  $x * y = \bar{x} + y$ . Let  $z = x * y$ , value of  $z * x$  is

- (A)  $\bar{x} + y$
- (B)  $x$
- (C) 0
- (D) 1

Q26. Let  $f(x, y, z) = \bar{x} + \bar{y}z + xz$  be a switching function. Which one of the following is valid?

- (A)  $\bar{y}x$  is a prime implicant of  $f$
- (B)  $xz$  is a minterm of  $f$
- (C)  $xz$  is an implicant of  $f$
- (D)  $y$  is a prime implicant of  $f$

Q27. The simultaneous equations on the Boolean variables  $x, y, z$  and  $w$ ,

$$x + y + z = 1$$

$$xy = 0$$

$$xz + w = 1$$

$$xy + \bar{z}\bar{w} = 0$$

have the following solution for  $x, y, z$  and  $w$ , respectively

- (A) 0100
- (B) 1101
- (C) 1011
- (D) 1000

Q28. Given the following Karnaugh map, which one of the following represents the minimal Sum-of-Products of the map?

wx \ yz	00	01	11	10
00	0	x	0	x
01	x	1	x	1
11	0	x	1	0
10	0	1	x	0

- (A)  $xy + y'z$
- (B)  $wx'y' + xz + xz$
- (C)  $w'x + y'z + xy$
- (D)  $xz + y$

Q29. When an interrupt occurs, an operating system

- (A) ignores the interrupt
- (B) always changes state of interrupted process after processing the interrupt
- (C) always resumes execution of interrupted process after processing the interrupt
- (D) may change state of interrupted process to 'blocked' and schedule another process

Q30. RAID configuration of disks are used to provide

- (A) fault-tolerance
- (B) low speed
- (C) high data density
- (D) None of these

Q31. Arrange the following configuration for CPU in decreasing order of operating speeds: Hard wired control, vertical micro-programming, horizontal micro-programming

- (A) Hard wired control, vertical micro-programming, horizontal micro-programming
- (B) Hard wired control, horizontal micro-programming, vertical micro-programming



- (C) Horizontal micro-programming, vertical micro-programming, hard wired control
- (D) Vertical micro-programming, horizontal micro-programming, hard wired control

Q32. A processor needs software interrupt to

- (A) test the interrupt system of the processor
- (B) implement co-routines
- (C) obtain system services which need execution of privileged instructions
- (D) return from subroutine

Q33. In which of the following case is it possible to obtain different results for call-by-reference and call-by-name parameter passing?

- (A) Passing an expression as a parameter
- (B) Passing an array as a parameter
- (C) Passing a pointer as a parameter
- (D) Passing an array element as a parameter

Q34. What does the following code do?

```
int a, b;
:
a = a+b;
b = a-b;
a = a-b;
```

- (A) exchanges (a) and (b)
- (B) doubles (a) and stores in (b)
- (C) doubles (b) and stores in (a)
- (D) leaves (a) and (b) unchanged

Q35. An unrestricted use of the "goto" statement is harmful because

- (A) it makes it more difficult to verify programs
- (B) it increases the running time of the programs
- (C) it increases the memory required for the programs
- (D) it results in the compiler generating longer machine code

Q36. In which of the following cases is it possible to obtain different results for call-by reference and call-by-name parameter passing methods?

- (A) passing a constant value as a parameter
- (B) passing the address of an array as a parameter
- (C) passing an array element as a parameter
- (D) passing an array

Q37. Let P be a quicksort program to sort numbers in ascending order. Let  $t_1$  and  $t_2$  be the time taken by the program for the inputs [1 2 3 4] and [5 4 3 2 1], respectively. Which of the following holds?

- (A)  $t_1 = t_2$
- (B)  $t_1 > t_2$
- (C)  $t_1 < t_2$
- (D)  $t_1 = t_2 + 5\log 5$

Q38. Kruskal's algorithm for finding a minimum spanning tree of a weighted graph G with n vertices and m edges has the time complexity of

- (A)  $O(n^2)$
- (B)  $O(mn)$
- (C)  $O(m+n)$
- (D)  $O(m\log n)$



Q39. A binary search tree is generated by inserting in order the following integers: 50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60, 24. The number of nodes in the left subtree and right subtree of the root respectively is  
 (A) (4, 7)  
 (B) (7, 4)  
 (C) (8, 3)  
 (D) (3, 8)

Q40. A problem in NP is NP-complete if  
 (A) it can be reduced to the 3-SAT problem in polynomial time  
 (B) the 3-SAT problem can be reduced to it in polynomial time  
 (C) it can be reduced to any other problem in NP in polynomial time  
 (D) some problem in NP can be reduced to it in polynomial time

Q41. Let  $R_1$  and  $R_2$  be regular sets defined over the alphabet then  
 (A)  $R_1 \cap R_2$  is not regular  
 (B)  $R_1 \cup R_2$  is not regular  
 (C)  $\Sigma^* - R_1$  is regular  
 (D)  $R_1^*$  is not regular

Q42. Let  $r = 1(1 + 0)^*$ ,  $s = 11^*0$  and  $t = 1^*0$  be three regular expressions. Which one of the following is true?  
 (A)  $L(s) \subseteq L(r)$  and  $L(s) \subseteq L(t)$   
 (B)  $L(r) \subseteq L(s)$  and  $L(s) \subseteq L(t)$   
 (C)  $L(s) \subseteq L(t)$  and  $L(r) \subseteq L(s)$   
 (D)  $L(t) \subseteq L(s)$  and  $L(s) \subseteq L(r)$

Q43. Which of the following regular expression identities are true?  
 (A)  $r^*(^*) = r^*$   
 (B)  $(r^* s^*) = (r + s)^*$   
 (C)  $(r + s)^* = r^* + s^*$   
 (D)  $r^* s^* = r^* + s^*$

Q44. The number of substrings (of all lengths inclusive) that can be formed from a character string of length  $n$  is  
 (A)  $n$   
 (B)  $n^2$   
 (C)  $n(n-1)/2$   
 (D)  $n(n+1)/2 + 1$

Q45. In a compiler the module that checks every character of the source text is called  
 (A) the code generator  
 (B) the code optimizer  
 (C) the lexical analyzer  
 (D) the syntax analyzer

Q46. In some programming languages an identifier is permitted to be a letter followed by any number of letters or digits. If  $L$  and  $D$  denotes the sets of letters and digits respectively, which of the following expression defines an identifier?  
 (A)  $(L + D)^*$   
 (B)  $L(L + D)^*$   
 (C)  $(LD)^*$   
 (D)  $L(LD)^*$



Q47. Consider the SLR(1) and LALR(1) parsing tables for a context free grammar. Which of the following statements is not true?

- (A) The goto part of both tables may be different.
- (B) the shift entries are identical in both the tables.
- (C) the reduce entries in the tables may be different
- (D) the error entries in the tables may be different

Q48. A shift reduce parser carries out the actions specified within braces immediately after reducing with the corresponding rule of grammar

$S \rightarrow xx W$  {print "1"}

$S \rightarrow y$  {print "2"}

$W \rightarrow Sz$  {print "3"}

What is the translation of xxxxyzz using the syntax directed translation scheme described by the above rules?

- (A) 23131
- (B) 11233
- (C) 11231
- (D) 33211

Q49. Assume that the following jobs are to be executed on a single processor system

Job Id	CPU Burst time
p	4
q	1
r	8
s	1
t	2

The jobs are assumed to have arrived at time 0+ and in the order p, q, r, s, t. Calculate the departure time (completion time) for job p if scheduling is round robin with time slice 1.

- (A) 4
- (B) 10
- (C) 11
- (D) 12

Q50. Which scheduling policy is most suitable for a time-shared operating system ?

- (A) Shortest Job First
- (B) Round Robin
- (C) First come first serve
- (D) Elevator

Q51. The sequence ..... is an optimal non-preemptivescheduling sequence for the following jobs which leaves the CPU idle for ..... unit(s) of time.

Job	Arrival time	Burst time
1	0.0	9
2	0.6	5
3	1.0	1

- (A) {3, 2, 1}, 1
- (B) {2, 1, 3}, 0
- (C) {3, 2, 1}, 0
- (D) {1, 2, 3}, 5



Q52. Which of the following is an example of spooled device?

- (A) a line printer used to print the output of a number of jobs
- (B) a terminal used to enter input data to a running program
- (C) a secondary storage device in a virtual memory system
- (D) a graphic display device

Q53. The following table has two attributes A and C where A is the primary key and C is the foreign key referencing A with on-delete cascade.

A	C
2	4
3	4
4	3
5	2
7	2
9	5
6	4

The set of all tuples that must be additionally deleted to preserve referential integrity when the tuple (2, 4) is deleted is:

- (A) (3, 4) and (6, 4)
- (B) (5, 2) and (7, 2)
- (C) (5, 2), (7, 2) and (9, 5)
- (D) 1

Q54. Given the basic ER and relational models, which of the following is incorrect?

- (A) an attribute of an entity can have more than one value
- (B) an attribute of an entity can be composite
- (C) in a row of a relational table, an attribute can have more than one value
- (D) in a row of a relational table, an attribute can have exactly one value or a NULL value

Q55. Which normal form is considered adequate for normal relational database design?

- (A) 2 NF
- (B) 5 NF
- (C) 4 NF
- (D) 3 NF

Q56. Let  $R = (A, B, C, D, E, F)$  be a relation scheme with the following dependencies  $C \rightarrow F, E \rightarrow A, EC \rightarrow D, A \rightarrow B$ . Which of the following is a key for R?

- (A) CD
- (B) EC
- (C) AE
- (D) AC

Q57. Which of the following assertion is false about the Internet Protocol (IP)?

- (A) it is possible for a computer to have multiple IP addresses
- (B) IP packets from the same source to the same destination can take different routes in the network
- (C) IP ensures that a packet is forwarded if it is unable to reach its destination within a given number of hops
- (D) the packet source cannot set the route of an outgoing packets, the route is determined only by the routing tables in the routers on the way

Q58. The subnet mask for a particular network is 255.255.31.0, which of the following pairs of IP addresses could belong to this network?

- (A) 172.57.88.62 and 172.56.87.23.2



- (B) 10.35.28.2 and 10.35.29.4
- (C) 191.203.31.87 and 191.234.31.88
- (D) 128.8.129.43 and 128.8.161.55

Q59. A subnet has been assigned a subnet mask of 255.255.255.192, which is the maximum number of hosts that can belong to this subnet?

- (A) 14
- (B) 30
- (C) 62
- (D) 126

Q60. In TCP, a unique sequence number assigned to each

- (A) byte
- (B) word
- (C) segment
- (D) message

Space for Rough.