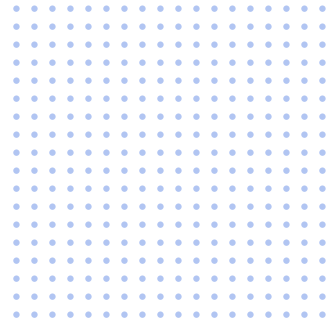




FOR KUET EXAM PREPARATION

KUET 2024 Question Paper · M.Tech Computer Science

EXAM	YEAR	TYPE	SUBJECT
KUET	2024	Question Paper	M.Tech Computer Science

1049

Sr. No.

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.
8. Do not make any stray mark on the OMR sheet.
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 }

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 2×2 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?
- CPU waiting for an interrupt signal
 - CPU periodically checking the status of an I/O device
 - DMA controller managing data transfers
 - 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?
- Data hazard
 - Control hazard
 - Structural hazard
 - Cache miss
16. In a pipelined CPU with a branch prediction mechanism, what happens if a branch is mispredicted?
- The pipeline continues without interruption
 - The pipeline is flushed and restarted
 - The instructions are re-fetched
 - 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?
- 1 cycle
 - 2 cycles
 - 3 cycles
 - 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?
- $O(1)$
 - $O(\log n)$
 - $O(n)$
 - $O(n \log n)$
19. In a doubly linked list, how do you insert a node between two existing nodes?
- Update the next and previous pointers of the new node and the adjacent nodes.
 - Only update next pointer of the previous node and previous pointer of the next node.
 - Only update the next pointer of the new node.
 - 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?
- Closed under union
 - Closed under intersection
 - Closed under complement
 - All of the above
34. Which of the following grammars is context-free?
- $S \rightarrow aS|bS|$
 - $S \rightarrow aSbSa|\epsilon$
 - $S \rightarrow aSb|SS|\epsilon$
 - All of the above
35. Which of the following is true for a regular language L?
- It satisfies the Pumping Lemma
 - It does not satisfy the Pumping Lemma
 - It can be accepted by a Pushdown Automaton
 - It can be accepted by a Turing Machine
36. Which of the following languages is recursively enumerable but not recursive?
- The language of all palindromes over $\{a, b\}$
 - The language of all binary strings that do not contain '11'
 - The language of all Turing Machines that halt on the empty input
 - 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 $\{w \in \{a, b\}^* | w \text{ has equal number of a's and b's}\}$?
- 1
 - 2
 - 3
 - 4
38. How many states does a minimal deterministic finite automaton (DFA) recognizing the language defined by the regular expression $(a|b)^2$ have?
- 1
 - 2
 - 3
 - 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 situation where two or more processes attempt to change shared data simultaneously
 - A situation where processes are waiting for each other to complete
 - A situation where a process is waiting indefinitely for a resource
 - 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).
- P1, P3, P4, P5, P2
 - P3, P4, P2, P1, P5
 - P3, P5, P4, P1, P2
 - 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?
- 2
 - 3
 - 4
 - 1
48. If a system uses 32-bit addresses with a 4 KB page size, how many bits are used for the page offset?
- 10 bits
 - 12 bits
 - 14 bits
 - 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?
- 0.5 seconds
 - 0.4 seconds
 - 0.6 seconds
 - 0.8 seconds
50. What is the purpose of a locking protocol in database systems?
- To manage the concurrency of transactions and prevent conflicts
 - To ensure data integrity by enforcing referential constraints
 - To optimize query execution plans
 - 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
