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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree Supplementary Examination May 2023 (2019 Scheme)

Course Code: CST308

Course name: COMPREHENSIVE COURSE WORK

Max. Marks: 50 Duration: 1Hour

Instructions: ***(1) Each question carries one mark. No negative marks for wrong answers***
(2) Total number of questions: 50
(3) All questions are to be answered. Each question will be followed by 4 possible answers of which only ONE is correct.
(4) If more than one option is chosen, it will not be considered for valuation.

1. Which data structure is used to store the undo history in a web browser?

   a) Stack b) Queue c) Linked List d) Hash table

2. When a pop() operation is called on an empty queue, what is the condition called?

   a) Overflow b) Underflow c) Syntax Error d) Garbage Value

3. Given a binary tree with the following elements: 50, 25, 75, 10, 30, 60, 90. Which traversal technique will produce the following sequence? 10, 30, 25, 60, 90, 75, 50.

   a) Pre-order b) In-order c) Post-order d) Level order

4. Which sorting algorithm has a time complexity of O(n log n) in the average and worst case?

   a) Bubble sort b) Insertion sort c) Quick sort d) Selection sort

5. Which of the following statements about a linked list is true?

   a) It has a fixed size. b) Elements stored contiguously in memory c) It allows for efficient random access d) It consists of nodes linked by pointers

6. Which type of linked list has its last node pointing to the first node?

   a) Singly linked list b) Doubly linked list. c) Circular linked list. d) Sparse linked list.

7. Travelling salesman problem is an example of

   a) Dynamic Algorithm b) Greedy Algorithm c) Recursive Approach d) Divide & Conquer

8. Time complexity of Depth First Traversal of is

a) $\Theta(|V|+|E|)$ b) $\Theta(|V|)$ c) $\Theta(|E|)$ d) $\Theta(|V|*|E|)$

9. Visiting root node after visiting left and right sub-trees is called

a) In-order Traversal b) Pre-order Traversal c) Post-order Traversal d) Level order

10. How is the 2nd element in an array accessed based on pointer notation?

a) *a + 2 b) *(*a + 2) c) &(a + 2) d) *(a + 2)

11 Which of the following is NOT a primary function of an operating system?

a) Memory management b) Device management c) File management d) Database management

12 The Banker's algorithm grants resource requests if:

a) The requested resources are immediately available. b) The requested resources do not exceed the maximum claim of the process. c) The requested resources do not exceed the total resources available in the system d) All of the above

13 The Banker's algorithm is applicable to which type of resource allocation problem?

a) Preemptive resource allocation. b) Non-preemptive resource allocation. c) Dynamic resource allocation. d) Distributed resource allocation.

14 The Dining Philosophers problem can lead to a deadlock if:

a) All the philosophers pick up their left chopstick first. b) All the philosophers pick up their right chopstick first. c) All the philosophers try to pick up both chopsticks simultaneously. d) All the philosophers are hungry at the same time.

15 In the Dining Philosophers problem, the maximum number of philosophers who can eat simultaneously without deadlock is:

Answer: d) N-1, where N is the total number of philosophers.

a) 1 b) 2 c) 3 d) N-1, where N is the total number of philosophers.

16 Which memory management technique allows for efficient utilization of memory by allocating memory in variable-sized blocks?

a) Paging b) Segmentation c) Swapping d) Fragmentation

17 A deadlock in an operating system occurs when:

a) A process is unable to access a required resource indefinitely. b)) A process gets stuck in an infinite loop. c) A process exceeds its allocated memory limit. d) A process encounters an error during execution.

18 Consider a system with four processes: P1, P2, P3, and P4. The arrival times and burst times for each process are given in the table below:

Process	Arrival Time	Burst Time
P1	0	4
P2	2	6
P3	4	8
P4	6	2

Assuming the scheduling algorithm is First-Come, First-Served (FCFS), what is the average waiting time for these processes?

a) 6.5 b) 8.25 c) 9.75 d) 10.5

19 Consider a system with three resource types (A, B, and C) and four processes (P1, P2, P3, and P4). The maximum resource allocation needs for each process are as follows:

Process	Max Allocation (A, B, C)
P1	3, 1, 2
P2	2, 2, 3
P3	1, 3, 1
P4	4, 2, 1

The current resource allocation and the maximum available resources in the system are as follows:

Process	Allocation (A, B, C)	Available (A, B, C)
P1	1, 1, 0	2, 1, 1
P2	1, 0, 2	
P3	1, 2, 1	
P4	0, 1, 1	

Using the Banker's algorithm, is the system in a safe safe?

a) Yes b) No c) Cannot Determine d) None of these

20 Consider a system with five processes: P1, P2, P3, P4, and P5. The burst times for each process are given in the table below:

Process	Burst Time
P1	8
P2	4
P3	9
P4	5
P5	2

Assuming the scheduling algorithm is Round Robin with a time quantum of 3, what is the turnaround time for process P3?

a) 10 b) 11 c) 12 d) 13

21 A processor has an instruction cache with a hit rate of 90% and an access time of 1 ns. If the cache miss penalty is 20 ns, what is the average memory access time?

a) 1.1 ns b) 2 ns c) 2.2 ns d) 3 ns

22 A computer system uses a direct-mapped cache with a cache size of 8 KB and a block size of 32 bytes. How many bits are needed for the cache index?

a) 5 bits b) 7 bits c) 9 bits d) 11 bits

23 Which memory type is the closest to the CPU and provides fast access to frequently used data?

a) Cache memory b) Main memory (RAM) c) Virtual memory d) Secondary memory (Hard Disk)

24 Which addressing mode uses a base register plus an offset to calculate the memory address?

a) Immediate addressing mode b) Direct addressing mode c) Indirect addressing mode d) Indexed addressing mode

25 A computer system uses a 32-bit virtual address and a 4 KB page size. How many entries are there in the page table?

a) 256 entries b) 512 entries c) 1024 entries d) 2048 entries

26 In a pipelined processor, which hazard occurs when the current instruction depends on the result of a previous instruction that has not yet completed?

a) Data hazard b) Control hazard c) Structural hazard d) Pipeline hazard

27 Which cache mapping technique provides the fastest access time but has limited capacity?

a) Direct mapping b) Associative mapping c) Set-associative mapping d) Fully associative mapping

28 Which technique is used to reduce the effect of memory latency in a pipelined processor?

a) Branch prediction b) Instruction-level parallelism c) Out-of-order execution d) Loop unrolling

29 Which technique is used to minimize the impact of control hazards in a pipelined processor?

a) Branch prediction b) Data forwarding c) Loop unrolling d) Out-of-order execution

30 Example of immediate addressing mode is:

a) MOV A, B b) ADD A, [B] c) SUB A, #10 d) JMP LABEL

31 Which of the following is NOT a component of a formal language?

a) Alphabet b) Syntax c) Semantics d) Compiler

32 Which type of automaton recognizes regular languages?

a) Pushdown automaton (PDA) b) Finite automaton (FA) c) Turing machine (TM) d) Linear-bounded automaton (LBA)

33 The Chomsky hierarchy classifies formal languages into how many levels?

a) 2 b) 3 c) 4 d) 5

34 Which type of automaton has both a finite control unit and an unbounded tape?

a) Finite automaton (FA) b) Pushdown automaton (PDA) c) Turing machine (TM) d) Mealy machine

35 The language accepted by a Turing machine with a halting state is known as:

a) Regular language b) Context-free language c) Context-sensitive language d) Recursive enumerable language

36 Which of the following is a non-deterministic automaton?

a) Finite automaton (FA) b) Pushdown automaton (PDA) c) Turing machine (TM) d) Mealy machine

37 Which of the following is true about regular languages?

a) They can be recognized by a Turing machine.
b) They can be recognized by a pushdown automaton.
c) They can be recognized by a linear-bounded automaton
d) They can be recognized by a finite automaton.

38 The Chomsky normal form (CNF) is a way to represent a context-free grammar (CFG) where:

a) All the production rules are in the form A -> Ab.
b) The start symbol is on the left-hand side of the production rules.
c) There are no ε-productions in the grammar
d) All the production rules have at most two non-terminals on the right-hand side

39 Which of the following is a regular expression for the language of all strings over {a, b} that contain at least one "a"?

a) ab
b) (ab)*
c) (a+b)*
d) (a+b)a(a+b)

40 Which type of automaton is used in lexical analysis for tokenizing source code?

a) Finite automaton (FA)
b) Pushdown automaton (PDA)
c) Turing machine ™
d) Linear-bounded automaton (LBA)

41 Typically, a database administrator (DBA) is responsible for:

a) Schema definition
b) Schema modification
c) Granting of authorization for data access
d) All of the above

42 Which of the following queries will retrieve students whose name has 'p' as the second letter ?

a) SELECT rollNo FROM student where name = '_p';
b) SELECT rollNo FROM student where name LIKE '_p';
c) SELECT rollNo FROM student where name LIKE '_p%';
d) SELECT rollNo FROM student where name IN '_p%';

43 Consider a relation R(A, B, C, D, E) and a set of all FDs that hold on R as given below:

{A → BC, CD → E, B → D, E → A}

Choose the correct option:

a) R is in 1NF, not in 2NF
b) R is in 2NF, not in 3NF
c) R is in 3NF, not in BCNF
d) R is in BCNF

44 Consider the following two sets of functional dependencies:

F = {A → C, AC → D, E → AD, E → H}

G = {A → CD, E → AH}

Choose the correct option:

a) only F covers G
b) only G covers F
c) F and G are equivalent
d) None of the above

45 Consider the following schedule S.

S: R1(X); W1(X); R2(X); W2(X); R1(Y); R2(Y);

Which of the following is a non-conflicting pair of operations in the schedule S?

a) R1(X); W1(X);
b) W1(X); R2(X);
c) W1(X); W2(X);
d) R1(X); W2(X);

46 To be conflict serializable, all transactions should follow _____

a) Binary locking b) Two phase locking c) Binary Locking with wait-for graph d) None of the above

47 Which of the following is NOT a type of database model?

a) Relational model b) Network model c) Hierarchical model d) Object-oriented model

48 Which of the following database models represents data as a collection of key-value pairs?

a) Relational model b) Hierarchical model c) Network model d) NoSQL model

49 Which SQL function is used to calculate the total number of records in a table?

a) COUNT b) SUM c) AVG d) MAX

50 Consider the statements given below:
S1: Data abstraction is the DBMS characteristic that allows program-data independence.
S2: Data models allow representation of a database at different levels of detail.
Choose the correct option:

a) S1: True; S2: True b) S1: True; S2: False c) S1: False; S2: True d) S1:False; S2: False

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