Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (R,S) / S6 (PT) / (WP) Examination April 2025 (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. The following numbers are inserted into an empty binary search tree in the given order: 10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree (the height is the maximum distance of a leaf node from the root)?

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

2. The maximum number of binary trees that can be formed with three unlabelled nodes is:

   a) 1 b) 5 c) 4 d) 3

3. ---------- is the best time complexity of bubble sort

   a) N^2 b) NlogN c) N d) N(logN)^2

4. Which data structure is mainly used for implementing the recursive algorithm?

   a) Queue b) Stack c) Binary tree d) array

5. Assume that the operators +, -, × are left associative and ^ is right associative. The order of precedence (from highest to lowest) is ^, x , +, -. The postfix expression corresponding to the infix expression a + b × c – d ^ e ^ f is

   a) abc × + def ^ ^ – b) abc × + de ^ f ^ – c) ab + c × d – e ^ f ^ d) – + a × bc ^ ^ def

6. The result evaluating the postfix expression 10 5 + 60 6 / * 8 – is

   a) 284 b) 213 c) 142 d) 71

7. The average number of key comparisons done in a successful sequential search in a list of length it is

   a) log n b) (n-1)/2 c) n/2 d) (n+1)/2

8. Which among the following statements(s) is/are true

(i) A hash function take a message of arbitrary length and generates a fixed code
(ii) A hash function take a message of fixed length and generate a code of variables
(iii) A hash function may give the same value for distinct messages

a) (i) only b) (ii) and (iv) only c) (i) and (iii) only d) (ii) only

9. Level order Traversal of a rooted Tree can be done by starting from root and performing

a) Breadth Fist Search b) Depth First Search c) Root Search d) Deep Search

10. Consider the following sequence of operations on an empty stack.

Push(54);push(52);pop();push(55);push(62);s=pop();

Consider the following sequence of operations on an empty queue.

enqueue(21);enqueue(24);dequeue();enqueue(28);enqueue(32);q=dequeue();

The value of s+q is _____

a) 86 b) 68 c) 24 d) 94

11 Which of the following need not necessarily be saved on a context switch between processes?

(i) General purpose registers
(ii) Translation lookaside buffer
(iii) Program counter
(iv) All of the above

a) (i) b) (ii) c) (iii) d) (iv)

12 In UNIX, the return value for the fork system call is ____ for the child process and ____ for the parent process.

a) A Negative integer, Zero b) Zero, A Negative integer c) Zero, A nonzero integer d) A nonzero integer, Zero

13 Which of the following page replacement algorithms suffers from Belady's anomaly

a) FIFO b) LRU c) Optimal Page Replacement d) Both LRU and FIFO

14 Dijkstra's banking algorithm in an operating system, solves the problem of

a) deadlock avoidance b) deadlock recovery c) mutual exclusion d) context switching

15 Consider a set of 5 processes whose arrival time. CPU time needed and the priority are given below

Process Priority	Arrival Time (in ms)	CPU Time Needed (in ms)	Priority
P1	0	10	5
P2	0	5	2
P3	2	3	1
P4	5	20	4
P5	10	2	3

smaller the number, higher the priority.

If the CPU scheduling policy FCFS, the average waiting time will be

a) 12.8 ms b) 8 ms c) 6 ms d) none of these

16 Which of the following statements is false?

(i) Segmentation suffers from external fragmentation
(ii) Paging suffers from internal fragmentation.
(iii) Segmented memory can be paged.
(iv) Virtual memory is used only in multi-user systems.

a) (i) b) (ii) c) (iii) d) (iv)

17 Process synchronization can be done on _____

a) hardware level b) software level c) both hardware and software level d) none of the mentioned

18 Which of the following is NOT a valid deadlock prevention scheme?

(i) Release all resources before requesting a new resource
(ii) Number the resources uniquely and never request a lower numbered resource than the last one requested.
(iii) Never request a resource after releasing any resource
(iv) Request and all required resources be allocated before execution.

a) (i) b) (ii) c) (iii) d) (iv)

19 Which of the following scheduling algorithms is non-preemptive?

a) Round Robin b) First-In First-Out c) Multilevel Queue Scheduling d) Multilevel Queue Scheduling with Feedback

20 Page fault occurs when

a) When a requested page is in memory b) When a requested page is not in memory c) When a page is corrupted d) When an exception is thrown

21 The address of the next instruction to be executed by the current process is provided by the _____

a) CPU registers b) Program counter c) Process stack d) Pipe

22 Which of the following is a type of computer architecture?

a) Microarchitecture b) Harvard Architecture c) Von-Neumann Architecture d) All of the mentioned

23 In the absolute addressing mode

a) the operand is inside the instruction b) the address of the operand is inside the instruction c) the register containing address of the operand is specified inside the instruction d) the location of the operand is implicit

24 Compared to RISC processors, CISC processors contain _____.

a) More registers and smaller instruction set b) Larger instruction set and fewer registers c) Fewer registers and smaller instruction set d) More transistor elements

25 Determine the number of clock cycles required to process 200 tasks in a six-segment pipeline. (Assume there were no stalls), each segment takes 1 cycle.

a) 1200 cycles b) 206 cycles c) 207 cycles d) 205 cycles

26 The advantage of ..... is that it can reference memory without paying the price of having a full memory address in the instruction.

a) Direct addressing b) Indexed addressing c) Register addressing d) Register Indirect addressing

27 Pipelining improves performance by:

a) decreasing instruction latency b) eliminating data hazards c) exploiting instruction level parallelism d) decreasing the cache miss rate

28 A computer has 64-bit instructions and 28-bit address. Suppose there are 252 two-address instructions. How many 1-address instructions can be formulated?

a) 2^24 b) 2^26 c) 2^28 d) 2^30

29 Identify the false statements:
S_1: Separate I/O address space does not necessarily mean that I/O address lines are physically separated.
S_2: Address decoder is an essential part of I/O interface.

a) S_1 b) S_2 c) Both S_1 and S_2 d) Neither S_1 and S_2

30 DMA interface unit eliminates the need to use CPU registers to transfers data from

a) MAR to MBR b) MBR to MAR c) I/O units to memory d) Memory to I/O units

31 A primary key is combined with a foreign key creates

(i) Parent-Child relation ship between the tables that connect them
(ii) Many to many relationship between the tables that connect them
(iii) Network model between the tables that connect them
(iv) None of the mentioned

a) (i) b) (ii) c) (iii) d) (iv)

32 If a relation is in BCNF, then it is also in

a) 1 NF b) 2 NF c) 3 NF d) All of the mentioned

33 If every non-key attribute is functionally dependent primary key, then the relation will be in

a) First normal form b) Second normal form c) Third form d) Fourth normal form

34 Tables in second normal form (2NF):

(i) Eliminate all hidden dependencies
(ii) Eliminate the possibility of a insertion anomalies
(iii) Have a composite key
(iv) Have all non key fields depend on the whole primary key

a) (i) b) (ii) c) (iii) d) (iv)

35 An entity in A is associated with at most one entity in B. An entity in B, however, can be associated with any number (zero or more) of entities in A.

a) One-to-many b) One-to-one c) Many-to-many d) Many-to-one

36 If D1, D2, .., Dn are domains in a relational model, then the relation is a table, which is a

subset of

a) D1+D2+ ... +Dn b) D1×D2× ... ×Dn c) D1∪D2∪ ... ∪Dn d) D1−D2− ... −Dn

37 Let E1 and E2 be two entities in an E/R diagram with simple single-valued attributes. R1 and R2 are two relationships between E1 and E2, where R1 is one-to-many and R2 is many-to-many. R1 and R2 do not have any attributes of their own. What is the minimum number of tables required to represent this situation in the relational model?

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

38 Given a relation schema R(x,y,z,w) with functional dependencies set F = {x → y, z → w}
All attributes take single and atomic values only

(i) Relation R is in First Normal Form
(ii) Relation R is in Second Normal Form
(iii) Primary key of R is xz

a) (i) and (iii) only b) (ii) and (iii) only c) (ii) only d) (iii) only

39 Given two tables
EMPLOYEE (EID, ENAME, DEPTNO)
DEPARTMENT (DEP NO., DEPTNAME)
Find the most appropriate statement of the given query:
Select count (*) 'total' from EMPLOYEE
Where DEPTNO IN (D1,D2)
Group by DETNO
Having count (*) > 5

(i) Total number of employees in each department D1 and D2
(ii) Total number of employees of department D1 and D2 if their total > 5
(iii) Display total number of employees in both department D1 and D2
(iv) The output of the query must have atleast two rows

a) (i) b) (ii) c) (iii) d) (iv)

40 Which of the following key constraints is required for functioning of foreign in the context of relational database

a) Unique Key b) Primary key c) Candidate key d) Check key

41 Which of the following statements in true?

(i) If a language is context free it can always be accepted by a deterministic push-down automaton.
(ii) The union of two context free languages is context free.
(iii) The intersection of two context free languages is context free.
(iv) The complement of a context free language is context free

a) (i) b) (ii) c) (iii) d) (iv)

42 Given the language L = {ab, aa, baa}, which of the following strings are in L*?

(i) abaabaaabaa
(ii) aaaabaaaa
(iii) baaaaabaaaab
(iv) baaaaabaa

a) (i), (ii) and (iii) b) (ii), (iii) and (iv) c) (i), (ii) and (iv) d) (i), (iii) and (iv)

43 S –>aSa| bSb| a| b ;

The language generated by the above grammar over the alphabet {a,b} is the set of

(i) All palindromes.
(ii) All odd length palindromes.
(iii) Strings that begin and end with the same symbol.
(iv) All even length palindromes.

a) (i) b) (ii) c) (iii) d) (iv)

44 Which of the following relates to Chomsky hierarchy?

(i) Regular<CFL<CSL<Unrestricted
(ii) CFL<CSL<Unrestricted<Regular
(iii) CSL<Unrestricted<CF<Regular
(iv) None of the mentioned

a) (i) b) (ii) c) (iii) d) (iv)

45 A push down automaton employs _____ data structure.

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

46 A regular language over an alphabet $\sum$ is one that cannot be obtained from the basic languages using the operation

a) Union b) Concatenation c) Kleene* d) All of the mentioned

47 In Moore machine, output is produced over the change of:

a) transitions b) states c) all of the mentioned d)) none of the mentioned

48 Which of the following statements is false ?

a) Halting problem of Turing machines is undecidable

b) Determining whether a context-free grammar is ambiguous is undecidable

c) Given two arbitrary context-free grammars G1 G2 and it is undecidable whether L (G1) = L (G2).

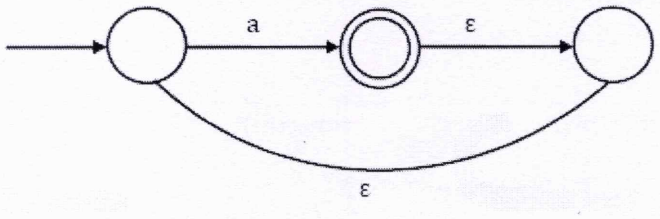
d) Given two regular grammars G1 G2 and it is undecidable whether L (G1) = L (G2)

a) (i) b) (ii) c) (iii) d) (iv)

49 A language L is said to be Turing decidable if:

a) recursive b) TM recognizes L c) TM accepts L d) recursive & TM recognizes L

50 What is the complement of the language accepted by the NFA shown below? Assume $\sum = \{a\}$ and ε is the empty string



a) Φ b) ε c) a^* d) $\{a, \varepsilon\}$

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