Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (R,S) / S6 (PT) (R,S) Examination May 2024 (2019 Scheme)

Course Code: CST 308

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. State True or False

   i) Binary search is used for searching in a sorted array
   ii) The time complexity of binary search is O(log n)

   a) True, True b) False, True c) True, false d) False,False

2. The postorder traversal of a binary tree is 8, 9, 6, 7, 4, 5, 2, 3, 1. The inorder traversal of the same tree is 8, 6, 9, 4, 7, 2, 5, 1, 3. The height of a tree is the length of the longest path from the root to any leaf. The height of the binary tree above is

   a) 1 b) 2 c) 3 d) 4

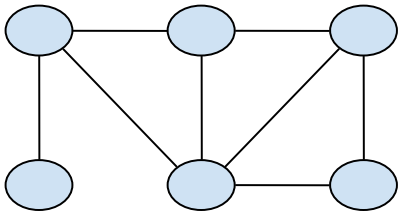
3. What can be said about the array representation of a circular queue when it contains only one element?

   a) FRONT = REAR + 1 b) FRONT = REAR - 1 c) FRONT = REAR = NULL d) None of these

4. + A* - BCD is a prefix expression. If A, B, C, D have value 5,4,2,3 respectively the expression evaluates to

   a) 13 b) 7 c) 11 d) 15

5. The Breadth First Search (BFS) algorithm has been implemented using the queue data structure. Which one of the following is a possible order of visiting the node in the graph below?



   a) MNOPQR b) NQMPOR c) QMNROP d) POQNMR

6. Which of the following can be the sequence of nodes examined in binary search tree while searching for key 88?

a) 90,40,65,50,88 b) 90,110,80,85,88 c) 190,60,90,85,88 d) 65,140,80,70,88

7. The data structure that is used to implement recursion is

a) Binary Tree b) Stack c) Queue d) All of the above

8. If we want to find the last node of a linked list, then the correct coding is

a) if(temp->link!=NULL) temp=temp->link
b) if(temp->data ==num) temp=temp->link
c) while(temp->link !=NULL) temp=temp->link
d) while(temp->link !=data) temp=temp->link

9. A hashing function which stores colliding items together in linked lists is:

a) Separate chaining b) Linear hashing with collision detection c) Universal hashing d) Linear hashing

10. For merging two sorted lists of size m and n into a sorted listbof size m+n, we required comparisons of

a) O(m) b) O(n) c) O(m+n) d) O(log m + log n)

11 The advantage of Round Robin CPU Scheduling over Shortest Job First Scheduling is

a) Better average turn around time b) Better average response time c) Both (a) and (b) d) Neither (a) nor (b)

12 The first fit, best fit and worst fit are strategies to select a _____

a) process from a queue to put in memory b) free hole from a set of available holes c) processor to run the next process d) all of the above

13 For a page size of 200 words, What is the page number and offset for a logical address of 1142

a) 5, 142 b) 2, 142 c) 6, 142 d) 7, 140

14 The process A, B, C. D and E references in the following order.
A, B, C, D, A, B, E, A, B, C, D, E for the LRU page replacement algorithms with 4 frames. The number of page faults with pure demand paging is

a) 6 b) 7 c) 8 d) 9

15 A counting semaphore was initialized to 9. Then 27P operations and 23V operations were completed on this semaphore. The resulting value of the semaphore is

a) 0 b) 5 c) 7 d) 13

16 Suppose that a disk drive has 5000 tracks, numbered from 0 to 4999. The drive is currently serving a request at track 143 and the previous was at track 125. The queue of pending requests in FIFO order is 86, 1470, 913, 1774, 984, 1509, 1022, 1750, 130 . Starting from the current position, the total distance in terms of track movement for SSTF is

a) 640 b) 246 c) 350 d) None

17 External fragmentation exists when ..... ?

a) enough total memory exists to satisfy a request but it is not contiguous
b) the total memory is insufficient to satisfy a request
c) a request cannot be satisfied even when the total memory is free
d) none of the mentioned

18 Consider the following three processes in the FCFS.

Process Id	Busrt Time	Arrival Time
P1	3	3
P2	6	6
P3	9	9

What is the average waiting time?

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

19 Which of the following algorithms is used to avoid deadlock?

a) Dynamic Programming algorithm
b) Primality algorithms
c) Banker's algorithm
d) Deadlock algorithm

20 Which of the following component does not belong to PCB (Process Control Block)?

a) CPU registers
b) CPU scheduling information
c) Accounting information
d) Operating System information

21 Which memory type is typically used for storing frequently accessed instructions and data to improve CPU performance?

a) RAM b) ROM c) Cache memory d) Virtual memory

22 In pipelining, what is a structural hazard?

a) Occurs when instructions are dependent on each other
b) Occurs when there are insufficient resources to execute instructions simultaneously
c) Occurs when control signals are misinterpreted
d) Occurs when there is a conflict in data values

23 Pipelining can introduce hazards in CPU execution. Which of the following is NOT a hazard typically encountered in pipelined architectures?

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

24 What does Register Transfer Logic (RTL) primarily deal with?

a) Data transmission between CPU and memory
b) Data transfer between registers within the CPU
c) Communication between peripheral devices
d) Data processing algorithms

25 Suppose a CPU has a clock speed of 2 GHz. How many clock cycles are required to execute an instruction that takes 4 clock cycles to complete?

a) 0.5 ns b) 2 ns c) 4 ns d) 8 ns

26 Which of the following Hazards occur at the following 2 instructions in pipeline?
ADD R4, R2, R8
ADD R4, R7, R4

a) RAW b) WAR c) WAW d) Both (a) and (b)

27 An addressing mode in which the location of the data is contained within the mnemonic is known as

a) Immediate addressing mode b) Implied addressing mode c) Register addressing mode d) Direct addressing mode

28 CISC stands for -

a) Complex Instruction Set Computer b) Complete Instruction Sequential Compilation c) Complex Instruction Sequential Compiler d) None of the above

29 When we perform subtraction on -7 and -5 the answer in 2's complement form is _____

a) 11110 b) 1110 c) 1010 d) 0010

30 The instruction cycle involves:

a) Fetch, Decode, Execute b) Fetch, Store, Execute c) Load, Execute, Store d) Decode, Execute, Store

31 The regular expression denoting the set of all strings NOT containing two consecutive 0's is given by

a) (0+10)* b) (0+10)*(ε+1) c) (1+01)*(ε+0) d) (ε+0)(101)*(ε+0)

32 The minimal FA accepting the set of all strings over alphabets {0,1} that have three consecutive 0's has -------

a) 4 states b) 5 states c) 6 states d) None

33 Which of the following grammars are equivalent?

(i) S-> AB
A->aA/a
B->b

ii) S-> a A
A-> bB
A-> a /b

iii) S-> aA
A->aA/ B
B->b

iv) S-> aA / bB
A->a
B-> b

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

34 The class of NP problems is NOT closed with respect to operator

a) Union b) Intersection c) Kleen Closure d) Compliment

35 Consider the follwoing two languages

$L1 = \{1^n0^n1^n0^n / n>=0\}$

$L2 = \{a^nb^k / n<=k<=2n\}$

Which of the following statement is True.

a) Both L1 and L2 are Context Free b) L1 is Context Free but not L2 c) L2 is context Free but not L1 d) Neither L1 nor L2 is context free

36 A type 0 or unrestricted grammar

a) Generates all the sets that are accepted by Halting Turing Machines but not by all Turing Machines b) Generates all the sets accepted by the class of Turing Machines c) Generates sets that are not regular languages d) None of these

37 Which of the following statement is True?

a) Every Regular Grammar is CFG b) Every CFG is Regular Grammar c) Every CSG is CFG d) None of these

38 The Tree which represents the derivations in a CFG is called

a) Parse tree b) Derivation Tree c) Both (a) and (b) d) None

39 If you consider a regular expression r, in which r = (11 + 111)* over Σ = {0, 1}, then the number of states in minimal DFA and NFA respectively are:

a) DFA – 4, NFA – 3 b) DFA – 3, NFA – 3 c) DFA – 3, NFA – 4 d) DFA – 4, NFA – 4

40 When L and L' happen to be recursively enumerable, here L is:

a) context-free b) regular c) recursive d) context-sensitive

41 Consider the relation R(A, B, C, D, E) and the functional dependency set F={AB→C, B→D, C→E }.What is the highest normal form of the relation R ?

a) 1NF b) 2NF c) 3NF d) BCNF

42 Which of the following statements are **TRUE** about an SQL query?

(P) An SQL query can contain a HAVING clause even if it does not contain a GROUP BY clause.

(Q) An SQL query can contain a HAVING clause only if it has a GROUP BY clause.

(R) All attributes used in the GROUP BY clause must appear in the SELECT clause.

(S) Not all attributes used in the GROUP BY clause need to appear in the SELECT clause.

a) P and S b) P and R c) Q and R d) Q and S

43 What is the meaning of following SQL query?

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SELECT name FROM student WHERE mobileNo LIKE '%0%0%';
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a) List of student name whose mobile number begins with two 0's

b) List of student name whose mobile number's second digit and fourth digit are 0.

c) List of student name whose mobile number starting and ending with two 0's

d) List of student name whose mobile number contain two 0's

44 Consider the following relational schema.

student(snum,sname,age)

Enrolled (snum,cname).

What is the output of the following query.?

SELECT cname, MIN(age) FROM student S, enrolled E

WHERE S.snum = E.Snum GROUP BY cname HAVING COUNT(*) > 3;

a) For each class find the age of the three youngest student who has enrolled in this class.

b) For each class with more than 3 students, finds the age of the youngest student who has enrolled in this class.

c) For atmost one class with more than 3 students, find the age of the youngest student who has enrolled in this class.

d) None of these.

45 Let El and E2 be two entities in an E/Rdiagram with simple single-valued attributes. Rl and R2 are two relationships between El and E2, where Rl is one-to-many and R2 is many-to-many. Rl 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) 3 b) 4 c) 5 d) 6

46 Which one of the following statements is **NOT** correct about the B+ tree data structure used for creating an index of a relational database table?

a) B+ Tree is a height-balanced tree.

b) Non-leaf nodes have pointers to data records.

c) Key values in each node are kept in sorted order.

d) Each leaf node has a pointer to the next leaf node.

47 Let the set of functional dependencies F = {QR→S, R→P. S→ Q} hold on a relation schema X = (PQRS). X is not in BCNF. Suppose X is decomposed into two schemas Y and Z, where Y = (PR) and Z = (QRS).

Consider the two statements given below.

I. Both Y and Z are in BCNF

II. Decomposition of X into Y and Z is dependency preserving and lossless

Which of the above statements is/are correct?

a) Both I and II b) I only c) II Only d) Neither I nor II

48 Map the following statements to TRUE(T) or FALSE(F) respectively

(i) In SQL, by default 'order by' clause lists items in descending order.

(ii) In SQL, 'SELECT' clause automatically eliminates all duplicates.

a) (i) TRUE and (ii) TRUE

b) (i) TRUE and (ii) FALSE

c) (i) FALSE and (ii) TRUE

d) (i) FALSE and (ii) FALSE

49 Which of the following is a DML command?

a) DELETE b) CREATE c) ALTER d) DROP

50 Consider the relation R (A, B, C, D, E) and the functional dependency set F = {AB→CD, ABC→E, C→A}. How many candidate keys are possible for the relation R ?

a) 1 b) 2 c) 3 d) 4

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