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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (R, S) / S6 (PT) (R) Examination June 2023 (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. The worst case complexity of quick sort is .....
   a) O(n) b) O(log n) c) $O(n^2)$ d) O(n log n)

2. What is the output of following function for start pointing to first node of following linked list? 1->2->3->4->5->6

```
void fun(struct node* start)
{
if(start == NULL)
return;
printf("%d ", start->data);
if(start->next != NULL )
fun(start->next->next);
printf("%d ", start->data);
}
```

   a) 1 4 6 6 4 1 b) 1 3 5 1 3 5 c) 1 2 3 5 d) 1 3 5 5 3 1

3. The prefix form of A-B/ (C * D ^ E) is?
   a) -/*^ACBDE b) -ABCD*^DE c) -A/B*C^DE d) -A/BC*^DE

4. Suppose we are sorting an array of eight integers using quicksort, and we have just finished the first partitioning with the array looking like this:
   2 5 1 7 9 12 11 10
   Which statement is correct?
   a) The pivot could be either the 7 or the 9.
   b) The pivot could be the 7, but it is not the 9
   c) The pivot is not the 7, but it could be the 9
   d) Neither the 7 nor the 9 is the pivot.

5. In a complete k-ary tree, every internal node has exactly k children or no child. The

number of leaves in such a tree with n internal nodes is:

a) nk b) (n – 1) k+ 1 c) n(k – 1) + 1 d) n(k – 1)

6. If a node in a Binary search tree has two children, then its inorder predecessor has .....

a) No child b) No left child c) No right child d) Two children

7. Using Bubble sort, the number of interchanges required to sort 5, 1, 6, 2 and 4 in ascending order is.....

a) 7 b) 5 c) 8 d) 6

8. Which one of the following is a sequence container?

a) stack b) dequeue c) queue d) set

9. Minimum number of queues needed to implement the priority queue is .....

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

10. The data structure used in breadth first search algorithm is .....

a) queue b) stack c) heap d) hash table

11 Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6 respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end.

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

12 Which of the following are NOT shared by the threads of the same process?

a) Stack
b) Registers
c) Address space
d) Message queue

a) a and d b) b and c c) a and b d) a, b and c

13 The problem of indefinite blockage of low priority jobs in general priority scheduling algorithm can be solved using

a) Swapping b) Dirty Bit c) Aging d) Compaction

14 Which of the following are the advantage of Multiprogramming?

a) High and efficient CPU utilization b) CPU scheduling is not required c) memory management is good d) All of the above

15 A memory management system has 64 pages with 512 bytes page size. Physical memory consists of 32 page frames Number of bits required in logical and physical address are respectively:

a) 14 and 15 b) 14 and 29 c) 15 and 14 d) 16 and 32

16 Consider the reference string:

0 1 2 3 0 1 4 0 1 2 3 4

If FIFO page replacement algorithm is used, then the number of page faults with three page frames and four page frames are ____ and ___ respectively.

a) 10, 9 b) 9, 9 c) 10, 10 d) 9, 10

17 Consider a disk queue with I/O requests on the following cylinders in their arriving order: 6,10,12,54,97,73,128,15,44,110,34,45. The disk head is assumed to be at cylinder 23 and moving in the direction of decreasing number of cylinders. Total number of cylinders in the

disk is 150. The disk head movement using SCAN –scheduling algorithm is:

a) 172 b) 173 c) 151 d) 161

18 At a particular time of computation, the value of a counting semaphore is 10. Then 12 P operations and "x" V operations were performed on this semaphore. If the final value of semaphore is 7, x will be

a) 8 b) 9 c) 10 d) 11

19 In the ..... algorithm, the disk head moves from one end to the other, servicing requests along the way. When the head reaches the other end, it immediately returns to the beginning of the disk without servicing any requests on the return trip.

a) LOOK b) SCAN c) C-SCAN d) C-LOOK

20 Paging suffers from ..... fragmentation

a) External b) Internal c) Physical d) All of the abve

21 The main virtue for using single Bus structure is _____

a) Fast data transfers
b) Cost effective connectivity and speed
c) Cost effective connectivity and ease of attaching peripheral devices
d) None of the mentioned

22 Memory Buffer Register (MBR) is connected to ___.

a) Control Bus b) Address Bus c) Data Bus d) System Bus

23 The basic component of arithmetic circuit is_____.

a) parallel subtractor. b) parallel adder. c) half adder. d) full adder.

24 When we use auto increment or auto decrements, which of the following is/are true?

1) In both, the address is used to retrieve the operand and then the address gets altered
2) In auto increment, the operand is retrieved first and then the address altered
3) Both of them can be used on general purpose registers as well as memory locations

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

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

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

26 The instruction -> Add LOCA, R0 does _____

a) Adds the value of LOCA to R0 and stores in the temp register
b) Adds the value of R0 to the address of LOCA
c) Adds the values of both LOCA and R0 and stores it in R0
d) Adds the value of LOCA with a value in accumulator and stores it in R0

27 Suppose, after analyzing a new cache design, you discover that the cache has far too many conflict misses, and this needs to be resolved. You know that you must increase associativity in order to decrease the number of cache misses. What are the implications of increasing associativity?

a) Slower cache access time b) Increase index bits c) Increase block size d) All of these

28 In a k-way set associative cache, the cache is divided into v sets, each of which consists of k lines. The lines of a set are placed in sequence one after another. The lines in set s are sequenced before the lines in set (s+1). The main memory blocks are numbered 0 onwards. The main memory block numbered j must be mapped to any one of the cache lines from. AA

a) (j mod v) * k to (j mod v) * k + (k-1)
b) (j mod v) to (j mod v) + (k-1)
c) (j mod k) to (j mod k) + (v-1)
d) (j mod k) * v to (j mod k) * v + (v-1)

29 Highly encoded schemes that use compact codes to specify a small number of functions in each micro instruction is _____

a) Horizontal organisation b) Vertical organisation c) Diagonal organisation d) None of the mentioned

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 Let E1 and E2 be two entities in an E/Rdiagram 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

32 Consider the join of a relation R with relation S. If R has m tuples and S has n tuples,then the maximum size of join is.....

a) mn b) m+n c) (m+n)/2 d) 2(m+n)

33 An index record appears for every search key value in the file

a) Dense index b) Sparse index c) Hash index d) Single-key index

34 If a relatin is in BCNF Then it is in:

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

35 Which of the following is a DDL command?

a) Select b) Create c) Insert d) Delete

36 The number of attributes in a relation is called its

a) cardinality b) size c) schema d) degree

37 Consider a database implemented using B+ tree for file indexing and installed on a disk drive with block size of 4 KB. The size of search key is 12 bytes and the size of tree/disk pointer is 8 bytes. Assume that the database has one million records. Also assume that no

node of the B+ tree and no records are present initially in main memory. Consider that each record fits into one disk block. The minimum number of disk accesses required to retrieve any record in the database is _____

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

38 Consider the relation R(A,B,C,D,E) and the set F={AB->CE, E->AB, C->D}.What is the highest normal form of this relation?

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

39 What is the Lost Update Problem also known as?

a) W-W Conflict b) W-R Conflict c) R-R Conflict d) None

40 Consider the following transactions with data items P and Q initialized to zero:

T1: read (P) ;
read (Q) ;
if P = 0 then Q : = Q + 1 ;
write (Q) ;
T2: read (Q) ;
read (P) ;
if Q = 0 then P : = P + 1 ;
write (P) ;

Any non-serial interleaving of T1 and T2 for concurrent execution leads to

a) A serializable schedule b) A schedule that is not conflict serializable c) A conflict serializable schedule d) A schedule for which a precedence graph cannot be drawn

41 The non- Kleene Star operation accepts the following string of finite length over set A = {(0,1) | where string s contains even number of 0 and 1}

a) 01, 0011, 010101 b) 0011, 11001100 c) ε, 0011, 11001100 d) ε, 0011, 11001100

42 Which of the following is a not a part of 5-tuple finite automata:

a) Input alphabet b) Transition function c) Initial State d) Output Alphabet

43 Which of the following conversion is not possible (algorithmically)?

a) Regular grammar to CFG b) Non Deterministic FA to Deterministic FA c) Non Deterministic PDA to Deterministic PDA d) Non Deterministic TM to Deterministic TM

44 Regular expression for all strings starts with ab and ends with bba is.....

a) aba^*b^*bba
b) ab(ab)^*bba
c) ab(a+b)^*bba
d) All of the mentioned

45 Pumping lemma is generally used for proving that

a) Given grammar is regular
b) Given grammar is not regular
c) Whether two given regular expressions are equivalent or not
d) None of these

46 Consider the regular language L= (111+11111)* . The minimum number of states in any DFA accepting this language is .....

a) 3
b) 5
c) 8
d) 9

47 Suppose a regular language L is closed under the operation halving, then the result would be .....

a) 1/4 L will be regular
b) 1/2 L will be regular
c) 1/8 L will be regular
d) All of the mentioned

48 Which among the following cannot be accepted by a regular grammar?

a) L is a set of numbers divisible by 2
b) L is a set of binary complement
c) L is a set of string with odd number of 0
d) L is a set of $0^n 1^n$

49 If L1 and L2 are context free languages, which of the following is context free?

a) L1*
b) L2UL1
c) L1.L2
d) All of the mentioned

50 Consider a grammar with the following productions

S--> aab | bac | aB
S --> aS |
S --> abb | ab
S a --> bdb

The above grammar is

a) Context free
b) Regular
c) Context sensitive
d) Type 0

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