## SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

## SIXTH SEMESTER B.TECH DEGREE EXAMINATION (R), MAY 2023

COMPUTER SCIENCE AND ENGINEERING
(2020 SCHEME)

## Course Code : 20CST308

Course Name : Comprehensive Course Work
Max. Marks :50
Duration : 75 Minutes
PART A
(Answer all questions. Each question carries 1 mark)

```
What is the time complexity of the following code:
int a \(=0\);
for \((i=0 ; i<N ; i++)\{\)
    for \((j=N ; j>i ; j--)\{\)
        \(a=a+i+j ;\)
    \}
\}
```

A. $\mathrm{O}(\mathrm{N} * \operatorname{Sqrt}(\mathrm{~N})$
B. $\mathrm{O}\left(\mathrm{N}^{*} \mathrm{~N}\right)$
C. $\mathrm{O}\left(\mathrm{N}^{*} \log (\mathrm{~N})\right)$
D. $\quad \mathrm{O}(\mathrm{N})$

What does 'stack underflow' refer to?
A. accessing item from an undefined
B. adding items to a full stack stack
C. removing items from an empty stack
D. index out of bounds exception

If several elements are competing for the same bucket in the hash table, what is it called?
A. Diffusion
B. Collision
C. Replication
D. Duplication

What is the time, and space complexity of the following code:
int $\mathrm{a}=0, \mathrm{~b}=0$;
for ( $\mathrm{i}=0 ; \mathrm{i}<\mathrm{N} ; \mathrm{i}++$ ) $\{$
$\mathrm{a}=\mathrm{a}+\operatorname{rand}($ );
\}
for $\begin{array}{r}(j=0 ; j<M ; j++) \\ b=b+\operatorname{rand}() ;\end{array}$
\}
A. $\mathrm{O}(\mathrm{N} * \mathrm{M})$ time
B. $\mathrm{O}(\mathrm{N}+\mathrm{M})$ time
C. $\mathrm{O}(\mathrm{N} / \mathrm{M})$ time
D. None of these

What is the time complexity of the following code:
int $\mathrm{i}, \mathrm{j}, \mathrm{k}=0$;
for ( $\mathrm{i}=\mathrm{n} / 2 ; \mathrm{i}<=\mathrm{n} ; \mathrm{i}++$ ) $\{$

$$
\text { for }(j=2 ; j<=n ; j=j * 2)\{
$$

$$
\mathrm{k}=\mathrm{k}+\mathrm{n} / 2
$$

\}
A. $\mathrm{O}\left(\mathrm{n}^{\wedge} 2\right)$
B. $\mathrm{O}(\mathrm{n})$
C. $\mathrm{O}(\mathrm{n} \log \mathrm{n})$
D. $O\left(n^{\wedge} 2 \operatorname{Logn}\right)$

6 Which of the following case does not exist in complexity theory?
A. Best case
B. Worst case
C. Average case
D. Null case

In the ..... algorithm, the disk arm goes as far as the final request in each direction, then reverses direction immediately without going to the end of the disk.
A. LOOK
B. SCAN
C. C-SCAN
D. C-LOOK

A systematic procedure for providing the CPU to new process is known as
A. Context Switching
B. Synchronization
C. Deadlock
D. Semaphore

For an effective operating system, when to check for deadlock?
A. Every time a resource request is
B. At fixed time intervals made at fixed time intervals
C. Every time a resource request is
D. None mentioned made

System calls of the operating system provides interface to
A. programs
B. processes
C. services
D. Utilities

Which one of the following is the deadlock avoidance algorithm?
A. Round-robin algorithm
B. Banker's algorithm
C. Elevator algorithm
D. Karn's algorithm

Which of the following condition is required for a deadlock to be possible?
A. A process may hold allocated resources while awaiting assignment of other resources
B. No resource can be forcibly removed from a process holding it
C. Mutual exclusion
D. All of the mentioned

Which of the following is not a special-purpose registers used by CPU?
A. Program counter (PC)
B. Stack Register
C. Accumulator
D. Memory address register
$\qquad$ is the branch logic that provides decision-making capabilities in the control unit:
A. Unconditional transfer
B. Controlled transfer
C. Conditional transfer
D. None of these

The size of virtual memory depends on the size of the
A. data bus
B. main memory
C. address bus
D. none of the above

Which of the architecture is power efficient?
A. RISC
B. CISC
C. Both A and B
D. None of the above

What does VLIW stands for?
A. Very Large Instruction Word
B. Very Long Instruction Word
C. Very Long Instruction Width
D. Very Long Instruction Width

The main components (or basic units) of a computer system are
A. Central Process Unit (CPU)
B. Input/Output unit
C. Memory unit (Storage unit)
D. All of the above

Which of the following is a Data Model?
A. Entity-Relationship model
B. Relational data model
C. Object-Based data model
D. All of the above

Relations produced from E-R Model will always be in $\qquad$ .
A. 1 NF
B. 2 NF
C. 3 NF
D. 4 NF

Which of the following is correct?
A. B-trees are for storing data on disk and B+ trees are for main memory.
C. Range queries are faster on $\mathrm{B}+$ trees.
B. B-trees are for primary indexes and $B+$ trees are for secondary indexes
D. The height of a B+ tree is independent of the number of records Functional Dependencies are the types of constraints that are based on $\qquad$
A. Key
B. Key revisited
C. Superset key
D. None of the mentioned

Which normal form is considered adequate for relational database design?
A. 2 NF
B. 3 NF
C. 4 NF
D. $B C N F$

A function that has no partial functional dependencies is in $\qquad$ form :
A. 2 NF
B. 3 NF
C. 4 NF
D. $B C N F$

The language accepted by a Turing machine is called
A. Recursive Ennumerable
B. Recursive
C. Recursive Enumerable and
D. None of the mentioned Recursive
Finite state machine can recognize
A. any grammar
B. only context-free grammar
C. Both (a) and (b)
D. only regular grammar

Let $S$ and $T$ be language over $=\{a, b\}$ represented by the regular expressions $\left(a+b^{*}\right)^{*}$ and $(a+b)^{*}$, respectively. Which of the following is true?
A. $\quad \mathrm{ScT}(\mathrm{S}$ is a subset of T$)$
B. TcS ( T is a subset of S )
C. $\mathrm{S}=\mathrm{T}$
D. $\mathrm{SnT}=\varnothing$

The value of $n$ if Turing machine is defined using $n$-tuples:
A. 5
B. 7
C. 8
D. 9

Let $\sum=\{0,1\}^{*}$ and the grammar $G$ be:
S->ع
S->SS
S->0S1|1S0
State which of the following is true for the given
A. Language of all and only Balanced
B. It contains equal number of 0's strings and 1's
C. Ambiguous Grammar
D. All of the mentioned
Max. number of states of a DFA converted from an NFA with $n$ states is:
A. n
B. $\mathrm{n}^{2}$
C. 2 n
D. None of these

## PART B

(Answer all questions. Each question carries 2 marks)
What is the time complexity of following code?
int $\mathrm{a}=0, \mathrm{~b}=0$;
for $(\mathrm{i}=0 ; \mathrm{i}<\mathrm{N} ; \mathrm{i}++$ ) $\{$
$\mathrm{a}=\mathrm{a}+\operatorname{rand}($ );
\}
for $(\mathrm{j}=0 ; \mathrm{j}<\mathrm{M} ; \mathrm{j}++$ ) $\{$
$b=b+\operatorname{rand}($ )
\}
A. $\mathrm{O}\left(\mathrm{N}^{*} \mathrm{M}\right)$ time
B. $\mathrm{O}(\mathrm{N}+\mathrm{M})$ time
C. $\mathrm{O}(\mathrm{N} / \mathrm{M})$ time
D. None of these

Consider the following definition in c programming language

```
struct node
{
int data;
struct node * next;
}
typedef struct node NODE;
NODE *ptr;
```

Which of the following c code is used to create new node?
A. ptr=(NODE*)malloc(NODE);
B. ptr=(NODE*)malloc(sizeof(NODE));
C. ptr=(NODE*)malloc(sizeof(NODE*));
D. $\quad \mathrm{ptr}=(\mathrm{NODE})$ malloc(sizeof(NODE));

There are 200 tracks on a disk platter and the pending requests have come in the order $-36,69,167,76,42,51,126,12$, and 199, Assume the arm is located at the $100^{\text {th }}$ track and moving towards track 200. If the sequence of disc access is 126 , $167,199,12,36,42,51,69$, and 76 then which disc access scheduling policy is used?
A. LOOK
B. SCAN
C. FCFS
D. C-SCAN

A process refers to 5 pages, A, B, C, D, E in the order: A, B, C, D, A, B, E, A, B, C, $\mathrm{D}, \mathrm{E}$. If the page replacement algorithm is FIFO, the number of page transfers with an empty internal store of 3 frames is?
A. 9
B. 10
C. 7
D. 8

If the main memory is of 8 K and the cache memory is of 2 K words. Its uses the associative mapping. Then each word of cache memory shall be
A. 11 bits
B. 21 bits
C. 16 bits
D. 20 bits

The effective address of the following instruction is MUL 5(R1,R2).
A. $5+[\mathrm{R} 1]+[\mathrm{R} 2]$
B. $5^{*}([\mathrm{R} 1]+[\mathrm{R} 2])$
C. $5+\mathrm{R} 1+\mathrm{R} 2$
D. $\quad 5+(\mathrm{R} 1 * \mathrm{R} 2)$

Consider the following relation schema pertaining to a student's database:
Student (rollno, name, address)
Enroll (rollno, courseno, coursename)
where the primary keys are shown underlined. The number of tuples in the Student and Enroll tables are 120 and 8 respectively. What are the maximum and minimum number of tuples that can be present in (Student * Enroll), where '*' denotes natural join?
A. 960,120
B. 120,8
C. 960,8
D. 8,8

Which will be best query for deleting row from the table $\qquad$
A. DELETE FROM TABLE _NAME
B. DELETE WHERE CUSTOMERWHERE CUSTOMER-STATE=" ";
STATE=" ";
C. DELETE TABLE _NAME WHERE CUSTOMER-STATE=" ";
D. DELETE FROM CUSTOMER WHERE CUSTOMER-=" ";
Which of the following language cannot be accepted by a regular expression?
A. Language of a set of numbers
B. Language of a set of binary divisible by 4 complement
C. Language of a set of 0 n 1 n
D. Language of a set of string with odd number of 0
Regular Expression for the language of words containing even number of a's is?
A. $(a+b) a b a(a+b)$
B. $a+b b a a b a a$
C. $(a+b) a b(a+b)$
D. $(b+a b a)$

