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**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)**

- 1 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.**  $O(N * \text{Sqrt}(N))$                       **B.**  $O(N*N)$   
**C.**  $O(N*\log(N))$                               **D.**  $O(N)$
- 2 What does 'stack underflow' refer to?  
**A.** accessing item from an undefined stack      **B.** adding items to a full stack  
**C.** removing items from an empty stack              **D.** index out of bounds exception
- 3 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
- 4 What is the time, and space complexity of the following code:  

```
int a = 0, b = 0;
for (i = 0; i < N; i++) {
    a = a + rand();
}
for (j = 0; j < M; j++) {
    b = b + rand();
}
```

**A.**  $O(N * M)$  time                              **B.**  $O(N + M)$  time  
**C.**  $O(N / M)$  time                              **D.** None of these
- 5 What is the time complexity of the following code:  

```
int i, j, k = 0;
for (i = n / 2; i <= n; i++) {
    for (j = 2; j <= n; j = j * 2) {
        k = k + n / 2;
    }
}
```

**A.**  $O(n^2)$                                       **B.**  $O(n)$   
**C.**  $O(n \log n)$                               **D.**  $O(n^2 \log n)$
- 6 Which of the following case does not exist in complexity theory?  
**A.** Best case                                      **B.** Worst case  
**C.** Average case                              **D.** Null case
- 7 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.



- 22 Functional Dependencies are the types of constraints that are based on \_\_\_\_\_
- A.** Key **B.** Key revisited  
**C.** Superset key **D.** None of the mentioned
- 23 Which normal form is considered adequate for relational database design?
- A.** 2NF **B.** 3NF  
**C.** 4NF **D.** BCNF
- 24 A function that has no partial functional dependencies is in \_\_\_\_\_ form :
- A.** 2NF **B.** 3NF  
**C.** 4NF **D.** BCNF
- 25 The language accepted by a Turing machine is called
- A.** Recursive Enumerable **B.** Recursive  
**C.** Recursive Enumerable and Recursive **D.** None of the mentioned
- 26 Finite state machine can recognize
- A.** any grammar **B.** only context-free grammar  
**C.** Both (a) and (b) **D.** only regular grammar
- 27 Let S and T be language over  $\Sigma = \{a, b\}$  represented by the regular expressions  $(a+b)^*$  and  $(a+b)^*$ , respectively. Which of the following is true?
- A.**  $S \subset T$  (S is a subset of T) **B.**  $T \subset S$  (T is a subset of S)  
**C.**  $S = T$  **D.**  $S \cap T = \emptyset$
- 28 The value of n if Turing machine is defined using n-tuples:
- A.** 5 **B.** 7  
**C.** 8 **D.** 9
- 29 Let  $\Sigma = \{0, 1\}^*$  and the grammar G be:  
 $S \rightarrow \epsilon$   
 $S \rightarrow SS$   
 $S \rightarrow 0S1 \mid 1S0$   
 State which of the following is true for the given
- A.** Language of all and only Balanced strings **B.** It contains equal number of 0's and 1's  
**C.** Ambiguous Grammar **D.** All of the mentioned
- 30 Max. number of states of a DFA converted from an NFA with n states is:
- A.** n **B.**  $n^2$   
**C.** 2n **D.** None of these

### PART B

**(Answer all questions. Each question carries 2 marks)**

- 31 What is the time complexity of following code?
- ```
int a = 0, b = 0;
for (i = 0; i < N; i++) {
  a = a + rand();
}
for (j = 0; j < M; j++) {
  b = b + rand();
}
```
- A.**  $O(N * M)$  time **B.**  $O(N + M)$  time  
**C.**  $O(N / M)$  time **D.** None of these
- 32 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.** ptr=(NODE)malloc(sizeof(NODE));

33 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<sup>th</sup> 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

34 A process refers to 5 pages, A, B, C, D, E in the order : A, B, C, D, A, B, E, A, B, C, D, 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

35 If the main memory is of 8K and the cache memory is of 2K 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

36 The effective address of the following instruction is MUL 5(R1,R2).

- A.** 5+[R1]+[R2]      **B.** 5\*([R1]+[R2])  
**C.** 5+R1+R2      **D.** 5+(R1\*R2)

37 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

38 Which will be best query for deleting row from the table \_\_\_\_\_

- A.** DELETE FROM TABLE \_NAME  
WHERE CUSTOMER-STATE=" ";      **B.** DELETE WHERE CUSTOMER-  
STATE=" ";  
**C.** DELETE TABLE \_NAME WHERE  
CUSTOMER-STATE=" ";      **D.** DELETE FROM CUSTOMER  
WHERE CUSTOMER-=" ";

39 Which of the following language cannot be accepted by a regular expression?

- A.** Language of a set of numbers  
divisible by 4      **B.** Language of a set of binary  
complement  
**C.** Language of a set of 0n1n      **D.** Language of a set of string with  
odd number of 0

40 Regular Expression for the language of words containing even number of a's is?

- A.** (a+b)aba(a+b)      **B.** a+bbaabaa  
**C.** (a+b)ab(a+b)      **D.** (b+aba)