

National Institute of Technology, Jamshedpur
Third Semester (Mid-Sem) Examination - Oct 2023

Branch: MCA (2nd Year)

Course Name: DBMS

Course Code: CS3301

Max. Marks: 30

Time: 2 Hours

Course Instructor: Dr. Dinesh Kumar

Instructions:

1. All questions are compulsory. All the subparts of a question are to be attempted together.

		Marks
Q 1	a) What is an unsafe query? Give an example and explain why it is important to disallow such queries.	[2]
	b) What factors might prompt you to opt for a database system instead of just saving data in operating system files? In what situations would it be advisable to avoid using a database system?	[2]
	c) Discuss, in short, the difference between logical and physical data independence. Does the relational model, as seen by an SQL query writer, provide physical and logical data independence? Explain.	[2]
	d) For the relation R(ABCDEFGH) with FD's= {CH->G, A->BC, B->CHF, E->A, F->EG such that F+ is exactly the set of FDs that hold for R }.Find the highest normal form of R.	[2]
	e) Let R1 (<u>A</u> , B, C) and R2 (<u>D</u> , E) be two relation schema, where the primary keys are shown underlined, and let C be a foreign key in R1 referring to R2. Suppose there is no violation of the above referential integrity constraint in the corresponding relation instances r1 and r2. Write an relational algebra expressions that would necessarily produce an empty relation?	[2]
Q 2	a) Consider the following information about a university database:	[5]
	<ul style="list-style-type: none"> • Professors have an SSN, a name, an age, a rank, and a research specialty. • Projects have a project number, a sponsor name (e.g., NSF), a starting date, an ending date, and a budget. • Graduate students have an SSN, a name, an age, and a degree program (e.g., M.S. or Ph.D.). • Each project is managed by one professor (known as the project's principal investigator). • Each project is worked on by one or more professors (known as the project's co-investigators). • Professors can manage and/or work on multiple projects. • Each project is worked on by one or more graduate students (known as the project's research assistants). • When graduate students work on a project, a professor must supervise their work on the project. Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one. • Departments have a department number, a department name, and a main office. • Departments have a professor (known as the chairman) who runs the department. • Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job. • Graduate students have one major department in which they are working on their degree. • Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take. 	

Design and draw an ER diagram that captures the information about the university. Use only the basic ER model here; that is, entities, relationships, and attributes. Be sure to indicate any key and participation constraints.

- b) Consider the university database and the ER diagram you designed in Q2 (a). Write SQL statements to create the corresponding relations and capture as many of the constraints as possible. If you cannot capture some constraints, explain why. [5]
- c) Consider the following Schema: [5]

```
Suppliers(sid: integer, sname: string, address: string)
Parts(pid: integer, pname: string, color: string)
Catalog(sid: integer, pid: integer, cost: real)
```

Write the following queries in relational algebra:

- Find the *sids* of suppliers who supply every part.
- Find the *sids* of suppliers who supply every red or green part.
- Find the *sids* of suppliers who supply every red part or supply every green part.
- Find the *pids* of the most expensive parts supplied by suppliers named Yosemite Sham.
- Find the *pids* of parts supplied by at least two different suppliers.

- d) Consider the instance of the Sailors relation shown in below Figure [5]

<i>sid</i>	<i>sname</i>	<i>rating</i>	<i>age</i>
18	jones	3	30.0
41	jonah	6	56.0
22	ahab	7	44.0
63	moby	null	15.0

Figure: An Instance of *Sailors*

- If you divide the sum just computed by the count, would the result be the same as the average? How would your answer change if these steps were carried out with respect to the *age* field instead of *rating*?
- Consider the following query: Find the names of sailors with a higher rating than all sailors with *age* < 21. The following two SQL queries attempt to obtain the answer to this question. Do they both compute the same result? If not, explain why. Under what conditions would they compute the same result?

```
SELECT S.sname
FROM Sailors S
WHERE NOT EXISTS ( SELECT *
```

```
      FROM Sailors S2
      WHERE S2.age < 21
      AND S.rating <= S2.rating )
```

Query I

```
SELECT *
FROM Sailors S
WHERE S.rating > ANY ( SELECT S2.rating
      FROM Sailors S2
      WHERE S2.age < 21 )
```

Query II

- Let us define instance S1 of Sailors to consist of the first two tuples, instance S2 to be the last two tuples, and S to be the given instance. Show the left outer join of S with itself, with the join condition being *sid*=*sid*.
- Show the right outer join of S with itself, with the join condition being *sid*=*sid*.
- Show the full outer join of S with itself, with the join condition being *sid*=*sid*.

*****End of Question Paper*****

**NATIONAL INSTITUTE OF TECHNOLOGY,JAMSHEDPUR
DEPARTMENT OF COMPUTER SC. AND ENGINEERING**

MID TERM EXAMINATION

Subject Code : CA33109

Subject Name: Computer Communications and Network

Time: 2 Hours

Subject Teacher: Tanu Priya

Course Name: MCA (3rd sem)

Full Marks: 30

Answer all questions.

Q1. Answer the short question:- **2 x 5=10**

- (i) **Write the difference between serial transmission and parallel transmission.**
- (ii) **Write about the protocols present in the transport layer.**
- (iii) **What are networking devices ? write some networking devices .**
- (iv) **What are the main components of data communication? Explain with a diagram.**
- (v) **What is multiplexing? What is the need of multiplexing.**

Q2. (a) Explain the OSI Model with a neat diagram and explain the function of each layer.

(b) Write the difference between circuit switching and packet switching. **5 x 2=10**

Q3. (a) Explain the following. **2 x 5=10**

- (i) **What is topology? Explain different types of topologies with their uses.**
- (ii) **Write the difference between FDM and TDM.**
- (b) **Write a comparative study between simplex, half duplex and full duplex transmission mode.**

NATIONAL INSTITUTE OF TECHNOLOGY, JAMSHEDPUR

MID SEMESTER EXAMINATION (OCTOBER 2023)

SEMESTER: 3rd (2022 Batch)

BRANCH: M.C.A

TIME: 2 Hours

SESSION: 2023 - 2024

CREDIT: 4

FULL MARKS: 30

Subject: CA3303 Design and Analysis of Algorithms

INSTRUCTIONS:

- 1) Answer **ALL** the questions and should be written in order.
- 2) Marks of the question and part thereof are indicated in the right hand margin.
- 3) Missing data, if any, may be assumed suitably.
- 4) Before attempting the question paper be sure that you have got the correct question paper.

- Q1.(a) What is the smallest value of n such that an algorithm whose running time is $100n^2$ runs faster than a algorithm whose running time is 2^n on the same machine? [2]
- (b) Write a recursive algorithm for generating fibonacci sequence and determine the time complexity of it. [5]
- (c) Find a tight bound on the following function: [3]
 $f(x) = x^4 - 23x^3 + 12x^2 + 15x - 21$

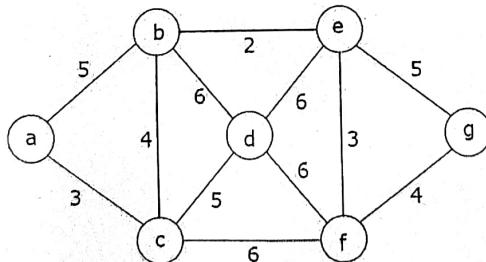
- Q2.(a) What is the recurrence equation of Divide and Conquer Technique? Use this technique to perform the complexity analysis of Quick sort algorithm. [6]
- (b) Solve the following recurrence using iteration method: [4]

$$T(n) = \begin{cases} 1, & \text{if } n = 1 \\ 3T(n/4) + n, & \text{if } n > 1 \end{cases}$$

OR

Discuss the different variations of Decrease and Conquer approach with suitable examples. [4]

- Q3.(a) Apply Dijkstra's algorithm to find the shortest paths from vertex a to all the other vertices for the following weighted connected graph: [5]



- (b) Use heap sort algorithm to sort the following list of elements: [5]
 32, 36, 29, 22, 20, 28, 14, 16, 15, 24

OR

Define 2-3 tree. Construct a 2-3 tree by successive insertion for the following list of alphabets in an empty tree: C O M P U T I N G [5]

XXXXX

NATIONAL INSTITUTE OF TECHNOLOGY JAMSHEDPUR
Department of Computer Science and Engineering
Odd Mid Semester Examination-2023

MCA (2nd Year): 3rd Semester
Course Name: Computer Graphics

Course Code: CA3304
Time: 02 Hour
Max. Marks: 30

Name of Faculty: Dr. Amit Majumder

Note: Attempt all the questions. Assume suitable missing data if any.

1. a) Assuming $0 < m \leq 1$ (m =slope of a line), derive decision parameter for Bresenham's line drawing algorithm and then write the algorithm. [5]
 - b) Using Bresenham's circle generation algorithm, find out the points in the first quadrant only for the circle centered at the origin and having a radius=8. [5]
 2. a) Given a 3D triangle with coordinate points A(3, 4, 1), B(6, 4, 2), C(5, 6, 3). Apply the reflection on the XY plane. Find out the new coordinates of the object using homogeneous coordinate system and matrix operation. [5]
 - b) A line whose end points are (4,6) and (10,10) is to be rotated about its midpoint by an angle 45^0 clockwise. Using matrix operations find the coordinates of the end points after rotation. [5]
 3. a) What is clipping? Write Cohen-Sutherland Algorithm for line clipping. [1+4]
 b) How does flood-fill algorithm work to fill a polygon? [5]
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Department of Computer Science and Engineering

Semester: Autumn Semester 2023-24

Examination: Mid Semester

Course Title: Java Programming

Course Code: CS3305

Full Marks: 30

Duration: 2 Hrs.

Semester: MCA 3rd Semester

Faculty: Dr. Mayukh Sarkar

(Answer All Questions)

1. Write a Java method “int factorial(int n)” that will determine factorial of the integer parameter n , by employing multithreading. Consider fixed number of threads to 8. Divide the range from 2 to n equally into 8 threads, and obtain the total factorial accordingly. The above stated method will be invoked as follows [10 has only been taken as an example. Your multithreaded code must not depend on that, it must work for any general value of n . For simplicity purposes, assume the determined values will remain within range of int. No need to consider long or BigInteger here]. [6]

```
public class Main {  
    static int factorial(int n) {  
        // your code goes here  
    }  
  
    public static void main(String[] args) {  
        int n = 10;  
        System.out.println(factorial(n));  
    }  
}
```

2. (a) What are the differences between checked exception and unchecked exception? Elaborate with suitable example. [2]
- (b) Create a checked exception as anonymous inner class within the main method. The exception variable, say e , upon invocation of $System.out.println(e)$, must output “Anonymous inner exception occurred”. [3]
3. (a) Let $Entity$ be an interface containing some method $m1()$. Moreover, classes $Reader$ and $Book$ are concrete classes implementing $Entity$ interface. Write brief codes for $Entity$, $Reader$ and $Book$. Create a factory method within $Entity$ interface that on receiving a String, will return the suitable subclass (either Reader or Book, and on any other String, return null). Elaborate Dynamic Method Dispatch via this example. [4]

- (b) Now, if *Reader* class has some method, say *m2()* (which is not in *Entity*), is it possible to invoke this method from the *Entity* variable? If not, what remedy you suggest to invoke the *Reader's m2()* via the *Entity* variable, provided you cannot modify *Entity*? [2]
4. Consider the following Buffer class:
- ```
public class Buffer {
 private int n;

 public void set(int n) {this.n = n;}
 public int get() {return n;}
}
```
- (a) Create two threads Producer and Consumer that will write to the variable *n* and read from it respectively, of a single shared Buffer object. The goal is synchronizing the two threads in such a way, that Consumer will not read as long as Producer has not written, and Producer will not write as long as Consumer has not read already written data. Show with suitable example sequence of execution, why simply synchronizing the Buffer object does not solve the problem. [3]
- (b) Modify the Producer and Consumer threads accordingly to solve the Producer-Consumer problem. [3]
5. Suppose you have been given the following class A in a package named *midsem.pkg1*.
- ```
package midsem.pkg1;  
  
public class A {  
    A()  
    {  
        protected void m1()  
    }  
}
```
- (a) create an anonymous inner class extending class A, inside main method in Main class in another package *midsem.pkg2*. [2]
- (b) What error will you receive while compiling Main.java? [1]
- (c) Perform necessary modifications in class A to alleviate the error. [2]
- (d) Let the anonymous inner class variable created in main; be *v*. After removing the above error, if you try to invoke *v.m1()*, you will face another error. Why? How will you correct the error? [2]