Daffodil International University

Department of Software Engineering
Faculty of Science & Information Technology
Final Examination, Fall 2023
Course Code: SE 214; Course Title: Algorithm Design and Analysis
Sections & Teachers: FE (L-2, T-2: A & B)

Time: 2:00 Hrs **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1. a) **Demonstrate** the concept of dynamic programming and explain how it differs from divide and conquer algorithms. 4 CO2, PO2, L3

   b) You're developing a system for a library that needs to efficiently sort its collection of books based on their unique identifiers. Each book has an alphanumeric identifier that includes both letters and numbers. 6
   Consider a set of book identifiers:
   Book 1: ID - "477"
   Book 2: ID - "3789"
   Book 3: ID - "211"
   Book 4: ID - "20"
   Book 5: ID - "5"
   Book 6: ID - "348"
   Explain the steps involved in Radix Sort and **apply** this algorithm to efficiently sorts books, ensuring an ordered arrangement of the library's book collection.

2. a) You're working on developing a social network platform that needs to implement a feature to find the shortest path of connections between users. Consider a simplified social network graph: 7 CO3, PO3, L6
   Users (Nodes): A, B, C, D, E, F
   Connections (Edges):
   A is friends with B and C
   B is friends with D and E
   C is friends with F
   Discuss the steps of Breadth-First Search and explain how this approach efficiently identifies the shortest path between users in a social network, considering the above connections between them.

   b) Consider a scenario where a user wants to exchange currency with denominations [1, 2, 5] for an amount of 7. Your task is to **create** a solution to determine the number of ways this user can achieve the desired amount using the available coin denominations. 8
   6

You're developing software for a genetics research institute. The institute is studying DNA sequences of two organisms. Consider the DNA sequences: **8**
Organism A: "AGGTAB"
Organism B: "GXTXAYB" BATG
Your task is to **create** a solution to determine the length of the longest common subsequence between these DNA sequences

3. You're working on a logistics management system for a delivery company that operates in a city with a complex road network. The company wants to optimize its delivery routes to minimize travel time between various locations. **7** **CO4, PO10, L6**
Locations (Nodes): A, B, C, D, E, F
Roads (Edges) with Travel Times (in minutes):
A - B: Time - 5
A - C: Time - 3
B - D: Time - 6
C - D: Time - 4
C - E: Time - 2
D - E: Time - 7
D - F: Time - 5
E - F: Time – 3 ACEF
Elaborate Dijkstra's Algorithm to find the shortest travel time between Location A and Location F.

Daffodil International University

Department of Information Technology & Management

Faculty of Science & Information Technology

Final Examination, Fall 2023

Course Code: SE 223; Course Title: Database Systems

Sections & Teachers: All

Time: 2:00 Hrs **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1. **a)** [Marks-10] CLO-3 *Level-3*

Department

Department_id	Department_name	*MANAGER_ID*	Location_id
10	*Administration*	*200*	1700
20	*Marketing*	*201*	1800
30	*Purchasing*	*114*	1700
40	*Human Resources*	*203*	2400
50	*Shipping*	*121*	1400

EMPLOYEE

EMPLOYEE_ID	FIRST_NAME	PHONE_NUMBER	HIRE_DATE	JOB_ID	SALARY	MANAGER_ID	DEPARTMENT_ID
100	Steven	5151234567	2003-06-17	AD_PRES	24000.00	*0*	*90*
101	Neena	5241234567	2005-09-21	AD_VP	17000.00	*100*	*90*
102	Lex	5151258567	2001-01-13	AD_VP	17000.00	*90*	*90*
103	Alexander	5151248567	2006-01-03	IT_PROC	9000.00	*102*	60
104	Bruce	515489567	2005-06-25	IT_PROG	6000.00	*103*	60
105	David	578489567	2006-02-05	IT_PROG	4800.00	*103*	60
106	Valli	689489567	2007-02-07	IT_PROG	4800.00	*103*	60

a. **Develop** a SQL query to retrieve the average salary for each department.
b. **Develop** a SQL query to find the names and salaries of employees who work in the "IT_PROG" department.
c. **Develop** a SQL query to find those employees who earn more than the average salary.
d. **Develop** a SQL query to find those employees who report to that manager whose first name is 'Lex'.
e. **Develop** a SQL query to know the details of employees whose manager from "Marketing Department'
f. **Develop** a SQL query to know the employee details whose job_id "AD_VP"
g. **Develop** a sql query to know the employee information whose name starts with "A"
h. **Develop** a SQL query to the phone number of those employees who are hired in between 17th june 2003 to 3rd January 2006.
i. **Develop** a SQL query to know the all department names.
j. **Develop** a SQL query to find employee id who gets highest salary

2. Consider the Student Registration System Report Form given below:

Registration System

PaymentID: *1001*
Payment Date: 24-05-2023
DepartmentNo: 35
Department Name: Software Engineering
DepartmentLocation: Ashulia, Dhaka

StudentID: C1123
StudentName: Rafiul Islam
StudentPhone: 01817654321
MentorID: 710001645
Mentorname: Aftab Uddin

CourseID	Course Title	Credit	Faculty Id	Faculty name
SE223	Database Systems	3	71000111	Rina Khan
SE224	Database Systems Lab	1	71000023	Rabbi Khan
SE222	Computer Architecture	3	71000045	Rahul Khan

CLO-2 *Level-4*

a) **Normalize** the table up to Third Normal Form (3NF); examining every step of the process from the "Registration system" given on question 2. [Marks-6]

b) **Distinguish** between full functional dependency and partial dependency from the above "Registration system" [Marks-4]

c) **List** the rules of normalization and explain why we need normalization to design databases. [Marks-4]

d) **Analyze** any two anomalies that may exist in the above "Registration System". [Marks-4]

e) [Marks-2]

Student_Id	Student_name	Student_Address	Course_no	Course_title

Explain the current normalization level of the given table.

3. a) **Establish** an Entity relationship diagram based on the "**Registration System**" given on question 2 with appropriate attribute type, cardinality, and relationship. [Marks-5] CLO-2 *Level-4*

4. a) **Demonstrate** the transaction properties and explain any two properties how it helps in the database. [Marks-3] CLO-5 *Level-2*

b) **Explain** states of transaction. [Marks-2]

Daffodil International University
Department of Software Engineering
Faculty of Science & Information Technology
Final Examination, Fall 2023
Course Code: SE221; Course Title: Object Oriented Design
Sections: All & Teacher's Initial: AG

Time: 2:00 Hrs | Marks: 40

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	a)	**Explain** the concept of Abstraction & Interface in Java. Show how we can achieve Abstraction & Interface with proper code examples.	[4]	CLO-3 Level- 4
	b)	Let's consider a scenario where we have different types of products in an online store. These products include electronics, clothing, and books. **Encapsulation:** • We want to encapsulate the details of each product type and provide a clean interface to interact with the products. • Each product type should have private fields to store its attributes and public methods to interact with those attributes. **Inheritance:** • The product types (electronics, clothing, and books) share some common properties. **Polymorphism:** • We want to calculate the shipping cost differently for each product type. **Abstraction:** • We want to abstract away the complexities of the product details from the client code. Must include variables: productID,ProductRating for each product Must include methods: method for calculating total price after adding discounted price. **Design** the whole code considering the above scenario. Make an object for each class and call the method for calculating the total price on each object.	[10]	
	c)	**Identify** the scope/accessibility of private vs public access modifiers.	[2]	

	d)	Driver Code:
		`public class Main {`
		`  public static void main(String[] args) {`
		`  Employee sikkhok = new Faculty();`
		`  Faculty grandMaster = new Programmer();`
		`  sikkhok.setName("John Doe");`
		`  sikkhok.setAge(30);`
		`  sikkhok.setSalary(5000.0);`
			[7]	

```
        grandMaster.setName("David");
        grandMaster.setAge(20);
        grandMaster.setSalary(78000.0);
        System.out.println("Name: " + grandMaster.getName() );
        System.out.println("Age: " + sikkhok.getAge() );
        System.out.println("Salary: " + sikkhok.getSalary() );
    }}
```

Now, **Construct** all the required classes and methods for this above driver code and Show the Output.

2.	a)	**Show** an abstract class called **Animal** with an abstract method called **jump()**. Implement two concrete classes, **Bagh and Singho**, that inherit from the Animal class. Each subclass should provide its implementation of the jump() method with a different jumping style for each Animal. Write a main class that creates **objects** of Bagh and Singho, then executes the jump() method on each object, and displays the jumping style of each animal. Desired Output: **Bagh jumps 10 feet .** **Singho jumps less than bagh.**	[7]	CLO-2 Level-2
	b)	**Show** the ~~output~~ of the following code Statements. Time complexity	[3]	

```
public class ExampleCode {

    public static void main(String[] args) {
        int n = 100;
        for (int i = 1; i <= n; i++) {
            for (int j = 1; j <= n; j++) {
                for (int k = 1; k <= n; k++) {
                        System.out.println("Found a match: i=" + i + ", j=" + j + ", k=" + k);
                        k =(n/2)+1 ;

                }
            }
        }
    }
}
```

n/2

3.	The CEO of Daal-vaat has come to your company with the requirement of making software for his company. The CEO is from a BBA background and has less knowledge about how the software things work. Money is not a problem for your client. You and your client live in the same city and he assures his full presence for the project. He wants to have his project pitch perfect. **Plan** which model you need to use in this case and why can't you use the other 3 models in this case?	[7]	CLO-4 Level- 6

Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Fall 2023

Course Code: SE532; Course Title: Introduction to Robotics

Section: A, B, C, D, E; Teacher Initial: MK

Exam Date: 8th Dec, 2023

Time: 2:00 Hrs **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.

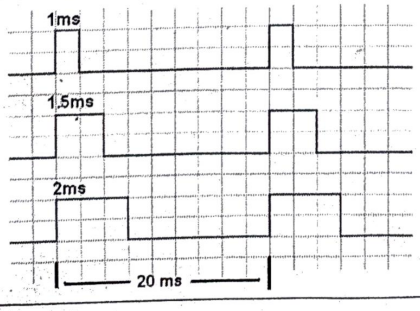
Consider the sample Arduino program below and answer the below questions. — CLO-2 *Level-5*

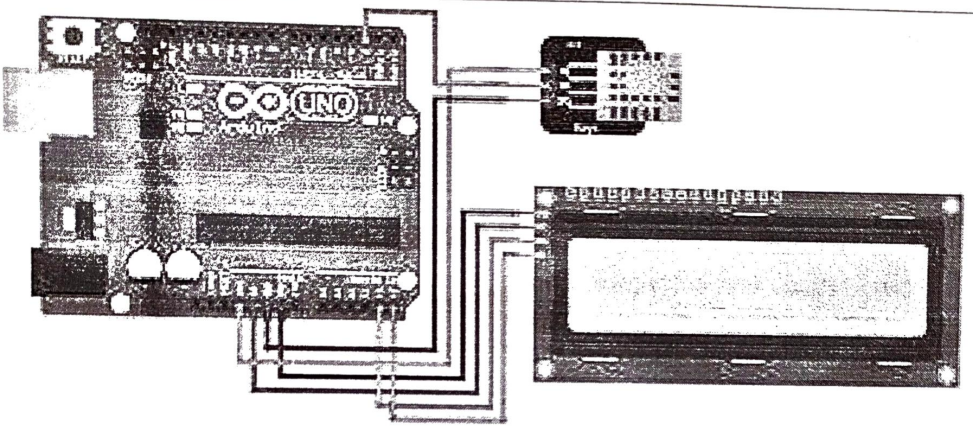
```
1   int ledPin = 9; // LED connected to digital pin 9
2   int analogPin = 3; // potentiometer connected to analog pin 3
3   int val = 0; // variable to store the read value
4   void setup() {
5     pinMode(ledPin, OUTPUT);
6   }
7   void loop() {
8     val = analogRead(analogPin);
9     int brightness = map(val, 0, 1023, 0, 255);
10    analogWrite(ledPin, brightness);
11  }
```

a)	**Select** the role of **pinMode()** function here and explain how this function affects the behavior of a specific pin on an Arduino board?	[Marks-2]
b)	**Describe** the purpose of the **setup()** function in the above sketch and how does it differ from **loop()** function.	[Marks-2]
c)	**Compare** and **Contrast** the difference between **analogRead()** and **anlogWrite()** functions.	[Marks-2]
d)	**Illustrate** a simple circuit diagram of the above Arduino sketch and also **explain** the **map()** function.	[Marks-2+2]

2. Consider the PWM signals below where the amplitude of the signals is 12 Volt. — CLO-3 *Level-6*

(i) (ii) (iii)



		how much average power will be generate for each signal.	[Marks-3*3=9]	
	b)	Atmega328P microcontroller has a built in 10-bit ADC and has a maximum reference voltage of 5 volts. **Determine** the step-size of the microcontroller. If the input voltage is 3.8 volts what will be the correspond digital value.	[Marks-3+3=6]	
	c)	**Explain** how PWM differs from analog output and digital output in Arduino, **Justify** your answer concerning LED brightness control.	[Marks-5]	
3.				CLO-4 *Level-6*
	a)	Briefly **explain** the protocol that establishes communication between Arduino and LCD display.	[Marks-5]	
	b)	**Develop** an Arduino program that reads temperature and humidity values from a DHT sensor and displays them on LCD screen's row 0 and row 1 respectively.	[Marks-5]	

Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Fall 2023

Course Code: SE 232; Course Title: Operating System and System Program

Time: 2 Hour **Marks: 40**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1. Consider the set of 6 processes whose arrival time and burst time is given with priority: Where (Lowest value = Highest Priority)

Process ID	Arrival Time	Burst Time	Priority
P1	0	7	5
P2	1	5	1
P3	2	3	4
P4	3	1	3
P5	4	2	2
P6	5	1	0

a) Apply the Preemptive version of the priority scheduling algorithm to find out average waiting time and turn-around time with Gantt chart. Marks 5 CO2, L3

b) Apply the SRTF scheduling algorithm to find out the average waiting time and turn-around time Gantt chart. Marks 5 CO2, L3

2. a) Elaborate deadlock concept with the conditions of its occurring with diagrams Marks 5 CO3, L1

b) A system has 5 processes and 3 allocable resources. The current allocation and maximum needs are as follows. Total number of resources A, B, C are 10, 6, 7. Marks 5 CO3, L3

Processes	Allocation A B C	Max A B C
P0	1 1 2	4 3 3
P1	2 1 2	3 2 2
P2	4 0 1	9 0 2
P3	0 2 0	7 5 3
P4	1 1 2	1 1 2

Identify if the system is in a safe state.

c) Consider six memory partitions of size 200 KB, 400 KB, 600 KB, 500 KB, 300 KB and 250 KB. These partitions need to be allocated to four processes of sizes 357 KB, 210 KB, 468 KB and 491 KB in that order. Marks 6 CO3, L3

Apply the contiguous memory allocation of processes using-

i. First Fit Algorithm
ii. Best Fit Algorithm
iii. Worst Fit Algorithm

d) Explain the concept of paging technique for memory management with a diagram. Marks 4 CO3, L4

e) Analyze the advantages of variable size partitioning of main memory over fixed size partitioning using proper examples and diagram. Marks 3 CO3, L4

a) Request sequence = {176, 79, 34, 60, 92, 11, 41, 114} with a request queue (0-187) Marks 3 CO4, L5
Initial head position = 50
Direction = left

Evaluate the total seek time using SSTF algorithm

b) Evaluate the total seek time using SCAN algorithm for the scenario given in Q.3.a and compare the seek time for identifying the best disk scheduling algorithm for this request sequence. Marks 4 CO4, L5