Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Fall 2024

Course Code: SE214; Course Title: Algorithm Design & Analysis

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)*	A networking company uses a compression technique to encode the message before transmitting over the network. **Select** an greedy algorithm to compress the size of the message and demonstrate that the size has been reduced. Suppose the message contains the following characters with their frequency: **T = 9, X = 5, H = 45, C = 12, A = 13, E = 16**	[Marks-5]	CLO-3 *Level-4*
	b)	You're working as a software developer, maintaining a project hosted on GitHub. During the development process, you make several changes to a document, and GitHub provides a feature to manage different versions. Version 1: "SOFTWARE" Version 2: "OFFER" **Analyze** the similarity between these two versions by determining the length of the longest common subsequence using dynamic programming, and also **identify** the subsequence.	[Marks-5]	
	c)	You are a cargo manager at a shipping company. You have a cargo container with a limited weight capacity of 8 kg. Your task is to maximize the total value of the items you can load into the container without exceeding the weight capacity.	[Marks-5]	

Item	Weight	Value
1	3	10
2	4	10
3	5	15
4	2	9

Identify the items to load into the container that will **maximize** the value of the cargo using a dynamic programming approach. Remember

		that You cannot take a fractional part of an item (each item is either taken whole or not taken at all.)		
	d)	You are organizing a charity event where attendees can donate money using coins of different denominations. The available coin denominations are {1, 2, 4, 5} units. **Predict** the **number of ways** the attendees can donate a total of 6 units using the available coin denominations.	**[Marks-5]**	
2.		You are planning a road trip across several towns. Each road between towns has a specific travel time in minutes. The road network is as follows: Home - Town A: 15 Home - Town B: 10 Town A - Town B: 5 Town A - Town C: 20 Town B - Town D:10 Town C - Town D:30 Town C - Town E:15 Town D - Town E:10 Represent the above road network as an undirected graph and answer question 2(a) & 2 (b).		**CLO-4** ***Level-5***
	a)	Starting from "Home," you aim to explore the graph as deeply as possible along each branch before backtracking. Your chosen traversal method also follows a Last-In-First-Out (LIFO) approach. **Determine** the order in which the nodes are visited based on this strategy.	**[Marks-5]**	
	b)	**Explain** the process of Dijkstra's Algorithm to find the shortest travel time between Home and Town E and also show the shortest path to reach Town E.	**[Marks-5]**	
		You are responsible for designing the network infrastructure of a new office building. The building has multiple rooms (nodes) that need to be connected via network cables (edges). Each cable has a specific cost (weight) based on the distance between the rooms. You need to connect all the rooms with the minimum total cable cost while ensuring that the network remains fully connected. A - A: cost - 6 A - C: cost - 3 C - B: cost - 10 B - D: cost - 4 D - C: cost - 2 D - B: cost - 15 E - D: cost - 1 E - C: cost - 6 Represent the above network as an undirected graph and answer question 2(c) & 2 (d).		
	c)	Draw the network tree and **determine** the minimum cost to connect all rooms using a strategy that starts from any room and expands the network by adding the cheapest connection to a new room.	**[Marks-5]**	
	d)	Draw the network tree and **determine** the minimum cost to connect all rooms using a strategy that first sorts all the possible connections (edges) by their cost and then adds the cheapest connections while avoiding any cycles.	**[Marks-5]**	

Daffodil International University
Faculty of Science & Information Technology
Department of Software Engineering
Final Examination, Fall 2024
Course Code: SE221; Course Title: Object Oriented Design
Sections: AG[40A - 40C] , MBH[40D - 40G] , DB[40H, 40I]
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)	**Clarify** the purpose of Use case Diagram, Activity Diagram and Class Diagram in UML? Explain why we can not jump into the coding part directly?	[6]	CLO-3 Level- 2
	b)	At Daffodil International University, the student enrollment process begins when a prospective student decides to apply for admission. The student visits the campus or the university's official website to obtain an admission form. After carefully filling out the form, they submit it along with the necessary academic and identification documents to the Admission Office. The Admission Office reviews the submitted materials to ensure they meet the university's requirements. If any documents are missing or incomplete, the student is notified and asked to provide the additional information. Once the documents are verified, the student is directed to the Accounts Department to pay the admission fee. In the Accounts Department, the student completes the payment process and receives a receipt as proof of payment. The receipt and the verified documents are then forwarded to the Registrar's Office, where the final approval for enrollment takes place. The Registrar's Office cross-checks all the details and ensures the fee payment has been confirmed. After the approval is granted, the student receives an official confirmation of their enrollment. They are provided with a university ID card and login credentials for accessing the university's online systems. With these steps completed, the student is successfully enrolled at Daffodil International University and ready to begin their academic journey. **Visualize** the activity diagram considering the above scenario.	[10]	

	c)	Driver Code:
		`public class Main {`
		`  public static void main(String[] args) {`
		`  Demon Lucifer = new Vut();`
		`  Vut Leviathan = new Belphegor();`
		`  Lucifer.setName("Stalin");`
		`  Lucifer.setAge(1735265256420);`
		`  Lucifer.setDeath(True);`
			[7]	

```
        Leviathan.setName("Beelzebub");
        Leviathan.setAge(199965785683);
        Leviathan.setDeath(true);
        System.out.println("Name: " + Leviathan.getName() );
        System.out.println("Age: " + Lucifer.getAge() );
        System.out.println("Death Status: " + Lucifer.getDeath() );
    }}
```

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

2. a) Imagine a ticket counter at a theater where multiple agents (threads) handle customers. Each agent processes a ticket request, takes some time (simulated using `sleep`), and then moves on to the next customer. To manage the agents efficiently, their names are assigned and retrieved using `setName` and `getName` methods. **[4]** **CLO-2 Level-3**

Construct the working code for the above scenario.

b) **[6]**

Trace the output of the following code Statements.

```
class A{
      public int temp = 4;
      public int sum = 1;
      public int y = 2;
     public A(){
        y = temp - 2;
        sum = temp + 3;
        temp-=2;
      }
  public void methodA(int m, int n){
           int x = 0;
           y = y + m + (temp++);
           x = x + 2 + n;
         sum = sum + x + y;
   System.out.println(x + " " + y+ " " +
sum);
   }
}
```

```
class B extends A {
      public int x = 1;
     public int sum = 2;
      public B(){
      y = temp + 3 ;
      sum = 3 + temp + 2;
      temp-=1;
    }
  public B(B b){
       sum = b.sum;
        x = b.x;
    }
public void methodB(int m, int n){
       int y =0;
     y = y + this.y;
      x = this.y + 2 + temp;
       methodA(x, y);
       sum = x + y + super.sum;
        System.out.println(x + " " + y+ " "
+ sum);
   }
}
```

Consider the following Main method:

```
public static void main(String[] args){
A a1 = new A();
B b1 = new B();
```

		B b2 = new B(b1);
		a1.methodA(1, 1);
		b1.methodA(1, 2);
		b2.methodB(3, 2);
		}		

3.		Develop and implement the Builder Design Pattern for a burger store, where Burger must have patty and bun. But a customer may have cheese ,extra patty, egg, or sausage. You need to print the amount of extra things that the customer have taken as well.	[7]	CLO-4 Level- 5

Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Fall 2024

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.	Consider the following Schema and **Solve** with Relational Algebra for the following questions. **Customer:** (CustomerID, Name, Email, Phone) **Order:** (OrderID, CustomerID, OrderDate, TotalAmount) **Product:** (ProductID, Name, Price, Stock) **OrderDetails:** (OrderID, ProductID, Quantity) a. Retrieve the names of customers who placed an order on '2024-11-18'. b. List all products with stock less than 10. c. Find the total number of orders placed by each customer. d. List all customers who ordered the product named "Laptop". e. Retrieve the details of customers who have placed orders totaling more than $1,000.	[Marks-5]	CLO-2 *Level-4*
2. a)	**Develop** SQL queries for the given question and follow the schema on question 1: **i)** Retrieve the average of the total amount for all orders. **ii)** Find all customers who placed an order with a TotalAmount greater than $500. **iii)** Retrieve all products whose price is higher than the average product price. **iv)** Find customers who placed more orders than the average number of orders per customer. **v)** Retrieve the details of orders placed on the same date as the highest total order. **vi)** Get the name of the customer who placed the largest order by total amount.	[Marks-6]	CLO-3 *Level-3*
2. b)	**Consider the following 2 tables find the output of Inner, Left, Right and Full outer join**	[Marks-4]	CLO-3 *Level-3*

flightNo	from	to	distance	departs	aircraftId
101	New York	Los Angeles	4500	10:00 AM	A1
102	Chicago	Miami	2000	2:00 PM	A2
103	Dallas	Seattle	3000	6:00 PM	A2
104	Boston	Houston	2600	8:30 AM	A6

aircraftId	airName	range
A1	Boeing 737	5000
A2	Airbus A320	4500
A3	Embraer E175	3500
A4	Bombardier CRJ	4000

3. Consider the following information

Hospital Management System Data

PatientID: 021222000123456789
PatientName: John Doe
DepartmentName: Cardiology
DepartmentNo: 10
PatientEmail: johndoe@mail.com
PatientPhoneNo: 01589955454

VisitID: V001
VisitDate: 20-11-24
NextVisitDate: 04-12-24

Prescription:

MedicineID: M001
MedicineName: Aspirin
Dosage: 75 mg daily
MedicineManufacturer: Bayer

MedicineID: M002
MedicineName: Atorvastatin
Dosage: 10 mg nightly
MedicineManufacturer: Pfizer

DoctorID	DoctorName	DoctorSpecialization	DoctorPhoneNo
D001	Dr. Jane Smith	Cardiologist	01712233445
D001	Dr. Jane Smith	Cardiologist	01712233445

	a)	**Normalize** the table from 1NF up to BCNF; examining every step of the process from those tables given in question 3 with proper explanation.	[Marks-8]	CLO-4 *Level-4*
	b)	**List** the normalization rules and explain why we need normalization to design databases.	[Marks-4]	CLO-4 *Level-4*
	c)	**Distinguish** between full functional dependency and partial dependency and transitive dependency from the above tables.	[Marks-4]	CLO-4 *Level-4*
	d)	**Establish** an Entity relationship diagram based on the normalized tables with appropriate attribute type, cardinality, and relationship.	[Marks-4]	CLO-4 *Level-4*
4.		**Imagine a Banking System where a user is transferring funds from Account A to Account B. The transaction consists of several steps:** 1. **Check Account A for sufficient funds.** 2. **Debit Account A by the transfer amount.** 3. **Credit Account B with the transfer amount.** 4. **Commit the transaction if all steps succeed; otherwise, rollback if any step fails.**		
	a)	**Explain the** states of the transaction from scenario given in question 4.	[Marks-3]	CLO-5 *Level-2*
	b)	**Define** each component of ACID properties, and how they ensure reliability, integrity, and concurrency control in database transactions from scenario given in question 4.	[Marks-2]	CLO-5 *Level-2*

Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Fall 2024

Course Code: SE232; Course Title: Operating System & System Program

Sections & Teachers: All

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

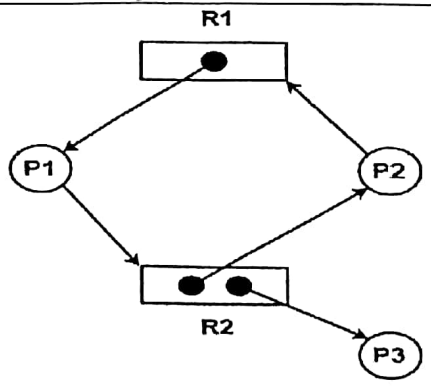
Answer ALL Questions

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

1		Imagine in a university dormitory where multiple students want to use a single Desktop (shared resource) to complete their tasks. To ensure order and prevent conflicts, synchronization mechanisms must be applied.		
	a)	**Apply** the multithreading concept and **demonstrate** an applicable model to execute multiple processes concurrently in your lab's desktop.	Marks [5]	CLO-2 Level-3
	b)	**Demonstrate** the solution of solving critical section problems in concurrent programming?	Marks [5]	
2	a)	**Illustrate** the memory management technique which faces no internal fragmentation.	Marks [5]	CLO-3 Level-4
	b)	There are 3 units of A, 3 units of B and 2 units of C are available. The system is currently in safe state. Consider the following independent requests for additional resources in the current state.	Marks [7]	

Process	Allocation			Maximum Need		
	A	B	C	A	B	C
P1	0	1	0	7	5	3
P2	2	0	0	3	2	2
P3	3	0	2	9	0	2
P4	2	1	1	4	2	2
P5	0	0	2	5	3	3

Analyze If a request from process P4 arrives for (1, 0, 0) can the request be granted immediately?

	c)	 Resource Allocation Graph	Marks [3]	

		A RAG of a system has been given. **Detect** if there occurs any deadlock or not with the necessary steps.		
	d)	Consider the page request string as {7,0,1,2,0,3,0,4,2,3,7,4,2,0,7}. There are three frames available for the system. **Compare** the page fault and hit ratio by Optimal page replacement algorithm.	Marks [5]	
3	a)	A computer system uses virtual memory to manage a large application, such as a photo editing software. The system employs paging, where the application's memory is divided into fixed-size pages that map to physical frames in RAM. But unfortunately this software is not loaded in physical memory. **Determine** the solution to solve this issue with proper architecture.	Marks [5]	CLO-4 Level-5
	b)	**Evaluate** the disk scheduling criteria through C-Elevator algorithm for the given scenario: Request sequence = {23, 224, 54, 14, 67, 123, 211, 44, 52} Disk range (2-250) Initial head position = 65; Direction = right	Marks [5]	

Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Fall 2024

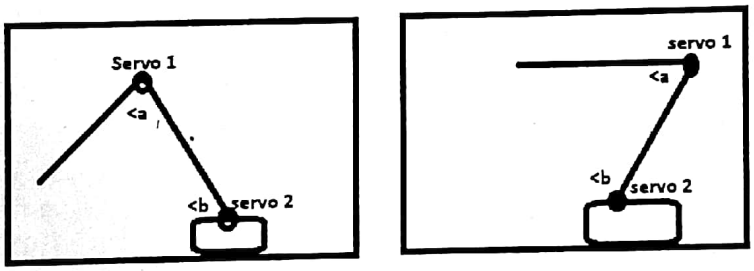
Course Code: SE532; Course Title: Introduction to Robotics

Sections & Teachers: 40(A,B,C,D)-HI; 40(E,F,G,H)-MT; 40(I)- MS

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)	In the given robotic manipulator, there are 2 servo motors labelled as servo 1 and servo 2. Initially, angle a of the manipulator was 30 degree and angle b was 45 degree. After some action, angle a was still 30 degree but angle b has become 120 degree. Draw the circuit and write the arduino **code** for this servo motor action. 	[Marks-5]	CLO-2 *Level-3*
	b)	Suppose, you are designing a robotic arm for an assembly line that requires: Precise movement for placing small components, Variable speed for different tasks and Ability to lift objects up to 2 kg. Choose between a servo motor, DC motor, or stepper motor for this design. Justify your choice by **showing** proper explanations.	[Marks-5]	
	c)	**Explore** the concept of Pulse Width Modulation (PWM) and describe how varying the duty cycle affects the output voltage and the behavior of a connected device, such as a motor.	[Marks-3]	

	)	i. A frame F and undergoes the following transformations. **Compute** the coordinates of the frame at the conclusion of transformations. F_{old}= $\begin{bmatrix} 0.866 & -0.5 & 0 & 2.5 \\ 0.5 & 0.866 & 0 & -1.25 \\ 0 & 0 & 1 & 3.75 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ 1. Rotation of 90∘ about the z-axis, 2. Followed by a rotation of 180∘ about the y-axis. --- ii. A frame, F is positioned in a 3D coordinate system. F_{old}= $\begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 0 & -1 & 4 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ The frame undergoes the following sequence of transformations: The frame is first rotated by 180∘ about the z-axis. Then, the resulting frame is rotated by 90∘ x-axis, Finally, the frame is translated by [0,−7,5], shifting its position in the space. **Determine** the final coordinates of the frame after applying all these transformations.	=12]	
2.	a)	You are tasked with designing a robot that will serve various purposes in an agricultural farm. One of its functions is **"Obstacle Avoiding"**. Focus on the obstacle avoiding function and **decide** the answers to the following questions in order to design this robot: i. List the components required to design this robot. ii. Draw and label the circuit diagram for this robot. iii. Describe the programming logic or code needed to make the robot avoid obstacles.	[Marks-8]	CLO-3 *Level-5*
	b)	If the robot were to have limbs (hands and legs) to assist in farming, **recommend** the robot design steps required to build this enhanced robot.	[Marks-4]	
	c)	To make this robot navigate in a smarter way using mapping and 3D visualization, we can use Gazebo in combination with ROS (Robot Operating System) to simulate and design a robot that navigates using mapping techniques. **Explain** the functions of Gazebo simulator.	[Marks-3]	

Daffodil International University

Department of Software Engineering
Faculty of Science & Information Technology
Final Examination, Fall-2024
Course Code: GE 235: Course Title: Principles of Accounting, Business & Economics
Sections: 40_A to 40_I Teacher's Initial: SAS, FAA
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.	**Rohan Consulting** starts its business on August 1, 2024. During the first month of operation, the following transactions occurred: 1. Investment by the owner cash Tk. 2,50,000 & equipment Tk. 35,000 in the business. 2. Purchase of equipment for Tk. 25,000 & paid Tk. 15,000. 3. Service performed for cash Tk. 28,000 & billed to the customer for Tk. 17,000. 4. Received Tk. 12,000 for due in transaction (3). 5. Monthly expenses on account: Salaries and wages Tk. 22,500, utilities Tk. 17,000 and advertising Tk. 5,000. 6. Withdraw of cash Tk. 14,000 by the owner. 7. Paid Tk. 8,000 on account in transaction (2). **Instructions:** Summarize the above transactions by preparing a tabular summary.	**Marks-6**	**CLO-1 Level-2**
2.	Ashim Traders was started on May 1, 2024 by AL Rafi. The following events and transactions occurred during the month: May 1 Rafi invested Tk. 1,40,000 cash and Tk. 28,000 furniture in the business. May 4 Purchased Equipment for cash Tk. 20,000 & Tk. 13,000 on account. May 8 Incurred Advertising expenses of Tk. 2,800 on account. May 12 Hired manager at a salary of Tk. 24,000 per month effective from June 1. May 13 Paid Tk. 6,500 cash for one year insurance policy. May 17 Withdrew Tk. 2,600 cash for personal use. May 30 Service performed for cash Tk. 35,000 and billed to the customer for Tk. 12,000. May 31 Paid Tk. 1,700 for advertising incurred at May 8. **Instructions:** a) Generalize the above transactions by journalizing them. **b)** Elaborate ledger entries for: **(i) Cash (ii) Service Revenue.**	**Marks-8**	**CLO-1 Level-2**

3.	On December-2023 the Trial balance of **Anwar Consulting Firm** as follows:		**Marks-12**	**CLO-2 Level-3**

Anwar Consulting Firm
Trial Balance
December 31, 2023

Number	Particulars	Debit (Tk.)	Credit (Tk.)
1	Cash	50,300	
2	Supplies	3,600	
3	Prepaid Insurance	12,000	
4	Land	1,25,000	
5	Furniture	31,000	
6	Account Payable		17,500
7	Unearned Revenue		12,400
8	Mortgage Payable		80,000
9	Owner's Capital		100,000
10	Owner's Drawing	5,000	
11	Service Revenue		80,000
12	Repair Expense	3,600	
13	Salaries Expense	45,000	
14	Utility Expense	14,400	
	Total	**289,900**	**289,900**

The following adjustments are pertaining of the Anwar Consulting Firm:
(a) Supplies has been remain unused at December-31, 2023 of Tk. 1,800.
(b) Insurance Premium expired during the period of Tk. 600.
(c) Depreciation of furniture is Tk. 3,600 per year.
(d) Mortgage payable interest rate is 8%.
(e) Unearned revenue shows Tk. 11,600 as unearned on December-31.

Instructions

a) Generate a worksheet on December 31, 2023.
b) Discover closing journal for the entries.

4.		Explain sole proprietorship. Elaborate the advantages and disadvantages of sole proprietorship.	**Marks-5**	**CLO-3 Level-2**
5.	a)	Explain economics. Discriminate between microeconomics and macroeconomics.	**Marks-5**	**CLO-4 Level-5**
	b)	Verify the changes in demand curve with proper table and graph if price increases.	**Marks-4**	