Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Spring 2024

Course Code: SE 223; Course Title: Database Systems

Sections & Teachers: NJ, KRA, AM

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)***

Employee

Employee_id	Employee_name	*Department_ID*	Department
101	Steven	*200*	HR
202	John Doe	*201*	Finance
301	Lex	*114*	Marketing
402	Alexander	*203*	Accounting
501	Bruce	*121*	IT

Salary

EMPLOYEE_ID	Salary	PHONE_NUMBER	HIRE_DATE	*Department_ID*
101	20000	5151234567	2003-06-17	*200*
202	3598	5241234567	2005-09-21	*201*
301	3000	5151258567	2001-01-13	*114*
404	79000	5151248567	2006-01-03	*203*
505	348799	515489567	2005-06-25	*121*
102	12390	578489567	2006-02-05	***123***

Develop SQL queries for the given question:

a. Retrieve the average salary for each department.
b. Find all employees who earn more than John Doe.
c. Find those employees who earn more than the average salary.
d. Count the number of employees in each department.
e. Get the details of employees who work in the "Marketing Department".
f. Find all employees who do not have a salary entry.
g. Get the employee information whose name starts with "A".
h. Find the phone numbers of those employees who were hired between 17th June 2003 and 3rd January 2006.
i. Find all employees whose salary is higher than the average salary of their department.
j. Find the employee id who gets the highest salary.

[Marks-10] **CLO-3** ***Level-3***

2. Consider the following tables:

Topic: DIU library Management

DIU library management data where student's information is recorded, when a student borrowed a book, when he returned etc.

StudentID: 024222000518888888
StudentName: Sumaiya
StudentEmail: sumu23@gmail.com
StudentPhoneNo:01789955454
BorrowID: 04

DepartmentName: SWE
DepartmentNo: 35
BorrowedDate: 20-04-24
ReturnDate: 04-05-24

BookID	BookName	AuthorName	Publisher
04	To Kill a Mockingbird	Harper Lee	HarperCollins
05	1984	George Orwell	Penguin Books
06	The Great Gatsby	F. Scott Fitzgerald	Scribner

a)	**Normalize** the table from 1NF up to BCNF; examining every step of the process from those tables given in question 2 with proper explanation.	[Marks-6]	CLO-4 *Level-4*
b)	**Distinguish** between full functional dependency and partial dependency from the above tables.	[Marks-4]	
c)	**List** the normalization rules and explain why we need normalization to design databases.	[Marks-4]	
d)	**Analyze** four anomalies that may exist in the above tables.	[Marks-4]	
e)	<table><tr><th><u>Student_Id</u></th><th>Student_name</th><th>Student_Address</th><th>Course_no</th><th>Course_title</th></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table> **Explain** the current normalization level of the given table.	[Marks-2]	
3. *a)*	**Establish** an Entity relationship diagram based on the tables given in question 2 with appropriate attribute type, cardinality, and relationship.	[Marks-5]	CLO-2 *Level-3*
4. *a)*	**Demonstrate** the transaction properties along with an explanation of any two properties, and **explain the** states of the transaction.	[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.	[Marks-2]	

Daffodil International University

Department of Software Engineering
Faculty of Science & Information Technology
Final Examination, Spring 2024
Course Code: SE 214; Course Title: Algorithm Design and Analysis
Sections & Teachers: FE (A, B, C), MHS (D)

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)*	Analyze the concepts of independent subproblems and overlapping subproblems within the realm of dynamic programming. Compare and contrast how the Divide and Conquer strategy addresses these aspects. Provide examples to illustrate the differences in approach and discuss the implications of each strategy on problem-solving efficiency and algorithmic complexity.	5	CO3, PO2, C4
	b)	You're going on a hiking trip and can only carry a limited weight in your backpack. You have a list of items, each with its weight and value. How would you use the 0/1 knapsack problem to determine the optimal selection of items to maximize the total value you can carry without exceeding the weight limit?	5	
	c)	You are designing a file compression software similar to ZIP or RAR. Explain how you would implement Huffman coding to compress text files efficiently. Provide an example of how variable length Huffman coding would be applied to compress a sample line of text.	5	
	d)	You're developing software for a genetics research institute. The institute is studying DNA sequences of two organisms. Consider the DNA sequences: Organism A: "AGGTAB" Organism B: "GXTXAYB" Your task is determining the length of the longest common subsequence between these DNA sequences using dynamic programming.	5	
2.	*a)*	Define what it means for a graph to be connected. Provide examples of connected and disconnected graphs, and explain how connectivity impacts various graph algorithms.	5	CO4, PO3, C5
	b)	Consider an unweighted graph with vertices A, B, C, D, and E, where the edges are: AB, AC, BC, BD, and CE. If you're starting from vertex A, apply BFS to find the shortest paths to all other vertices. Evaluate the performance of BFS from the context of time complexity.	5	
	c)	You have a large social network represented as a graph, where nodes represent people, and edges represent connections (friendships). You want to find all friends from a given person. Describe how you would employ DFS to traverse the graph and find the desired connections. Evaluate the time complexity of DFS in this context, considering the size of the network and its structure.	5	

d) 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. 5

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

Apply Dijkstra's Algorithm to find the shortest travel time between Location A and Location F.

Note: Provide detailed explanations and examples to support your answers. Marks will be awarded for clarity, accuracy, and understanding of the concepts.

Daffodil International University
Department of Software Engineering
Faculty of Science & Information Technology
Final Examination,Spring 2024
Course Code: SE221; Course Title: Object Oriented Design
Sections: All & Teacher's Initial: AG , SD , MBH , FRR

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 Encapsulation and Abstraction in Java. Show how we can achieve them with proper code examples.	[4]	CLO-3 PLO-2
	b)	Let's consider a scenario where we have different types of service through your site. These services include Flat-Renting, Room-Renting, and Tenant-Finding. **Encapsulation:** ● We want to encapsulate the details of each user and provide a clean interface to interact with the user. ● Each user and service should have private fields to store its attributes and public methods to interact with those attributes. **Inheritance:** ● The users (subscribedUser and GuestUser) share some common properties. **Polymorphism:** ● We want to calculate the totalPayableAmount differently for each service type. **Abstraction:** ● We want to abstract away the base code, so that we can manipulate the base version in future if needed Must include variables: serviceID,serviceSpeedRating for each service Must include methods: method for calculating total price after adding discounted price for subscribed users only. Consider the above scenario and **convert** it into code. Make an object for each class and call the method for calculating the total price on each object.	[10]	
	c)	**Elaborate** the need of the "try" and "catch" block.	[2]	

	d)	Driver Code:
		public class Main {
		public static void main(String[] args) {
		Student me = new ValoStudent("Shizuka");
		ValoStudent notMe = new BeshiValoStudent("Dekisugi");
		me.setStudyHour(9 , "making cookies");
		notMe.setStudyHour(12.30 , "avoid unnecessary fights" , "doing other's homework");
		//You may edit from here for calling the methods which show output.
			[7]	

		}} Desired Output: Hi , I am Shizuka. I study 9 hours a day. My hobby is making cookies. Hi , I am Dekisugi. I study 12.30 hours a day. My hobby is doing other's homework. I always avoid unnecessary fights. Now, **Construct** all the required classes and methods for this above driver code which shows the Desired Output:		
2.	a)	Create an abstract class called Nawab with an abstract method called khajna(). Implement two concrete classes, KrishnaChandra and KhambajRaj, that inherit from the Nawab class. Each subclass should provide its implementation of the khajna() method with a different mode of tax paid by each province. Write a main class that creates objects of KrishnaChandra and KhambajRaj, then executes the khajna() method on each object, and displays the mode of tax paid by each province. **Desired Output:** KrishnaChandra collects tax based on land ownership. KhambajRaj collects tax based on trade and commerce.	[6]	CLO-2 PLO-3

	b)	**Show** the **Output** of the following code Statements.
		`public class ExampleCode {`
		`public static void main(String[] args) {`
		`int n = 3;`
		`for (int i = 1 ; i <= n ; i++ ) {`
		`for (int j = i ; j <= n ; j++ ) {`
		`for (int k = j ; k <= n ; ) {`
		`k =(k*2);`
		`System.out.println("Found a match: i=" + i + ", j=" + j + ", k=" + k);`
		`} } } } }`
			[4]	

3.		The PaymentGateway interface represents the common interface expected by the client code. The LegacyPaymentGateway class is the existing class with an incompatible interface. The PaymentGatewayAdapter class implements the PaymentGateway interface and adapts the LegacyPaymentGateway interface to match the PaymentGateway interface. The client code can use either the modern payment gateway directly or the legacy payment gateway through the adapter, without any changes to its code. Also you have to add method for registration and login system , which creates the user class entity only once **Select** which design patterns you need to use in this case and design the code. Must construct multiple objects of the class from the main method.	[7]	CLO-4 PLO-5

Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Spring 2024

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

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 set of 6 processes whose arrival time and burst time is given Process ID | Arrival Time | Burst Time P1 | 1 | 7 P2 | 2 | 5 P3 | 0 | 3 P4 | 3 | 1 P5 | 4 | 2 P6 | 5 | 1		
	a)	**Apply** the algorithm that has the minimum average waiting time to find out the average waiting time and turn-around time.	Marks [5]	CLO-2 Level-3
	b)	**Demonstrate** the concept of solving the mutual exclusion problem in a critical section using semaphores.	Marks [5]	
2	a)	**Illustrate** the segmentation concept with the diagram in detail.	Marks [5]	CLO-3 Level-4

	b)	A system has 4 processes and 5 allocable resources. The current allocation and maximum needs are as follows. total number of resources A, B, C, D, and E are 11, 7, 3, 6, 4. **Identify** if the system is in a safe state or not with the sequence.	Marks [6]	

	Allocated					Maximum Needs				
P1	0	1	0	1	0	2	1	0	1	0
P2	2	0	0	0	1	3	3	1	2	2
P3	3	0	2	1	0	4	1	1	1	1
P4	2	1	1	1	1	2	2	1	2	1

	c)	**Analyze** If a request from process P3 arrives for (1,1,1,1), can the request be granted immediately?	Marks [4]	

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P1	0 0 1 2	0 0 1 2	3 3 1 2
P2	1 0 0 0	1 4 5 0	
P3	1 3 5 4	2 3 5 6	

	d)	Consider six memory partitions of size 200 KB, 400 KB, 600 KB, 500 KB, 300 KB 310 KB, and 250 KB. These partitions need to be allocated to five processes of sizes 357 KB, 210 KB, 468 KB, 300 KB, and 491 KB in that order. **Apply** the contiguous memory allocation of processes using- i. First Fit Algorithm ii. Best Fit Algorithm iii. Worst Fit Algorithm	Marks [5]	
3	a)	**Identify** the advantages and disadvantages of RAID in operating systems.	Marks [5]	CLO-4 Level-3
	b)	**Apply** SCAN algorithm to calculate the total seek time using for the given scenario: Request sequence = {176, 79, 34, 60, 92, 11, 41, 114} Disk range (2-250) Initial head position = 50; Direction = right	Marks [5]	

Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Spring 2024

Course Code: SE 532; Course Title: Introduction to Robotics

Sections & Teachers: 38- A, B; 39- A, B, C, D;

Md Hafizul Imran(HI); Masrufa Tasnim (MT)

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)	You are leading a team that is designing a new limbed robot system for exploration on rugged terrains. The robot must be capable of navigating uneven surfaces, climbing obstacles, and carrying a moderate payload. The design process will follow a typical limbed system development approach, as outlined in the provided content. **Demonstrate** the steps you would take to design this limbed robot system. Discuss what factors you would consider at each step, focusing on the robot's mobility, stability, and capability to carry a payload. Include considerations for conceptual design, detailed design, and evaluation.	[Marks-5]	CLO-2 *Level-2*
	b)	You are tasked with designing a robotic arm for an assembly line that can perform complex tasks such as picking, placing, and welding components. The arm must have multiple joints, allowing for flexible movement in different directions. Given the critical tasks involved, precise control of the arm's movements is essential. **Demonstrate** the process of designing this multi-joint robotic arm, focusing on the choice of actuators and control methods. **Write** the advantages and disadvantages of different actuator types and control methods, and explain how you would ensure the arm operates accurately and reliably.	[Marks-7]	
2.	a)	A point $P(7,3,1)^T$, is attached to a frame F and is subjected to the following transformations. **Compute** the coordinates of the point relative to the reference frame at the conclusion of transformations. 1. Rotation of 90° about the z-axis, 2. Followed by a rotation of 90° about the y-axis, 3. Followed by a translation of [4,-3,7].	[Marks-5]	CLO-2 *Level-3*

	b)	A frame Fnoa is located in the position P. After the following transformation the frame position has changed to Q[2,5,7]T. A rotation along the Z axis by anti-clock 45 degree but before that a translation along all axis by [2,3,5]. After those two, another rotation along the Y axis by 60 degrees followed by a translation along all axis by [3,-5,3]. **Compute** the position P with respect to Q.	[Marks-8]	
3	*a)*	You are developing a complex robotics application in ROS, and your team needs to visualize the robot's movements in a 3D environment to ensure proper operation. Additionally, you want to test the robot's behavior in a simulated environment before deploying it in the real world. **Evaluate** the ROS tools that are commonly used for 3D visualization and simulation.	[Marks-5]	CLO-3 *Level-5*
	b)	You are tasked with developing a ROS-based application for a robot that involves several sensors and actuators. The system should be able to communicate among different nodes to perform specific tasks. Your team decides to implement a communication model that uses both topics and services. Explain the software framework for implementing ROS in this actuator and **consider** which operating system will be the best to use for the ROS-based application.	[Marks-5]	
	c)	You are working on a project that requires controlling multiple servo motors simultaneously using an Arduino. The project involves a robotic arm with five joints, each controlled by a separate servo motor. The joints need to move to specific positions to achieve the desired arm movement pattern. **Recommend** an Arduino sketch that initializes five servo motors on different pins and controls their movements. The code should: • Attach each servo motor to a different digital pin. • Move all five servo motors to three distinct positions: 0 degrees, 90 degrees, and 180 degrees. • Include a delay of two seconds between each movement to allow the servos to complete their motion. • Repeat the movement pattern in a loop. Your answer should demonstrate how to initialize and control multiple servo motors, using appropriate functions and delays to manage their movements.	[Marks-5]	

Daffodil International University

Department of Software Engineering
Faculty of Science & Information Technology
Final Examination, Spring 2024
Course Code: GE 235; Course Title: Principles of Accounting, Business & Economics
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) Mishel Company started operation at April 1, 2017. The trial balance columns of the work sheet of the company are as under: — **Marks-10** — **CLO-2 Level-4,2**

Mishel Company
Work Sheet
June 30, 2017

Trial Balance

A/c No.	Account Title	Debit Taka	Credit Taka
101	Cash	9,000	
102	Owner's capital		11,500
103	Equipment	7,000	
104	Supplies	2,000	
105	Accounts payable		3,000
106	Prepaid Insurance	1,200	
107	Service revenues		7,500
108	Salary expense	1,500	
109	Accounts Receivable	2,500	
110	Gasoline expense	200	
111	Owner's drawing	1,100	
112	Unearned service revenues		2,500
	Total	**24,500**	**24,500**

Other data to be considered:

i. Services performed but unbilled Taka 500
ii. Depreciation on Equipment is Taka 300 per month
iii. One- third of the pre-paid insurance expired during the period
iv. An inventory count shows Taka 250 of unused supplies at June 30
v. Accrued but unpaid employee salaries were Taka 600 at June 30

Required: Analyze the given data and complete the work sheet

b) Explain the classification of adjusting journal entries. — **Marks-2**

2.	a)	Mr. Tapan started his own deliver[illegible] service. Tapan Deliveries on [illegible] 2016. Following transactions occurred in his business during the month of June 2016. June 1 Mr. Tapan invested Tk. 100,000 cash in the business. 2 Purchased a used van for deliveries for Tk.12,000. Paid Tk. 2000 cash and signed a note payable for the remaining balance 3 Paid Tk. 500 for office rent of the month. 5 Performed Tk. 4,400 of services on account. 9 Withdrew Tk. 200 cash for personal use. 12 Purchased supplies for Tk. 150 on account. 15 Received a cash payment of Tk. 1,250 for services provided on June 5. 30 Made cash payment Tk. 500 on the note payable. **Instruction:** Analyze the effect of the above transactions on the accounting equation.	[illegible]	CLO-1 *Level-4,3*
	b)	Prepare an Income Statement for the month to interpret the performance of the organization	Marks-2	
3.	a)	Mr. Ahmed opened his service business "Ahmed Servicing" on First January 2017. During January, the following transactions were completed in his business: Jan 1: Mr. Ahmed invested $10,000 cash in the business Jan 3: Purchased equipment for $6,000, paying $3,000 cash and balance on account Jan 7: Paid $1,200 cash for a one year insurance policy effective from January 1 Jan 10: Services provided for $12,000. One- third received cash now and remaining on account Jan 15: Paid $ 2,000 for the equipment purchased on January 3, 2017 Jan20: A cash payment of $2,500 was made for employee salaries Jan 25: Received $1,000 from customer billed on January 10 Jan 30: Withdrew $600 for personal purpose **Instruction:** Identify the transactions from the above statements and journalize the transactions in the general journal.	Marks-4	CLO-1 *Level-4,2*
	b)	The balances of some selected accounts of Hasina Trading include Cash 25,000; Supplies 4,800; Prepaid Insurance 7,200; Land 1,10,000; Building 75,000; Unearned Revenues 10,000 Note payable 50,000; Accounts Payable 40,000; Capital 90,000; Owner's drawings 5,000; Service revenue 70,000, Rent expense 5,600; Prepaid Salaries 20,000 and Utility expense 7,400. **Instruction**: Classify the debit and credit of the balances and prepare a trial balance on 31 December 2023.	Marks-3	
4.	a)	How would you like to define business? Briefly explain the life cycle of a business organization.	Marks-3	CLO-3 *Level-2*
	b)	Discuss the main disadvantages of a partnership firm.	Marks-2	
5.	a)	What do you mean by macroeconomics and microeconomics? Explain the factors of production.	Marks-3	CLO-4 *Level-2,4,2*
	b)	Define law of demand. Identify the factors cause the demand curve to shift.	Marks-3	
	c)	How would you explain the market equilibrium? Briefly explain any three factors that determine the market supply of different commodities.	Marks-3	