Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Midterm Examination, Fall 2024

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

Level 2 Term 2

Sections & Teachers: FE(A, B, C), MHS(D), AAS(E), AAM(F,G), IAT(H,I)

Time: 1 Hour 30 Mins **Marks: 25**

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)*	void sum_of_squares_of_evens(int n) {
		int sum = 0;
		for (int i = 2; i <= n; i += 2) {
		sum += i * i;
		}
		printf("Sum of squares of even num up to %d is: %d\n", n, sum);
		}
		
		How does the time complexity of the provided code change as the input value (n) increases? **Translate** your answer by analyzing the number of operations performed in relation to the input size.
			[Marks-2]	**CLO-1**
				Level-4

	b)	int binarySearch(int arr[], int size, int target) {
		int left = 0;
		int right = size - 1;
		
		while (left <= right) {
		int mid = left + (right - left) / 2;
		if (arr[mid] == target) return mid;
		if (arr[mid] < target) left = mid + 1;
		else right = mid - 1;
		}
		return -1;
		}
		Analyze the time complexity of this code in terms of the input size (n) and **explain** your reasoning.
			[Marks-3]	

2.	*a)*	Given the array [57, 80, 42, 13, 95, 38, 29, 60], Sort this array using a divide and conquer method which is comparatively faster and time efficient. Ensure that your solution doesn't require additional memory beyond the input array itself. **Visualize** the step-by-step process of your chosen algorithm. **Describe** why you selected this algorithm for this case.	**[Marks-5]**	**CLO-2** ***Level-2***

	b)	You are managing a shop where items are stacked in a completely random order based on their weights. The items are labeled as follows: [15 kg, 3 kg, 9 kg, 7 kg, 1 kg, 12 kg]. You decide to reorganize these items from lightest to heaviest on the shelves by "repeatedly finding the minimum element and placing it at the first position on the shelves". **Explain** the step-by-step process of this reorganization, and **discuss** the best-case and worst-case time complexity of the chosen algorithm.	**[Marks-5]**	
	c)	You are given the following unsorted array [12, 3, 7, 8, 4, 6, 2, 1, 18] Convert the array in ascending order using Merge Sort.**Visualize** the division and merging steps clearly.	**[Marks-5]**	
3.	*a)*	You are managing a warehouse that needs to pack items into boxes for a special promotion, where each box has a maximum capacity of 75 KG. Each item has varying weight and value as follows:	**[Marks-5]**	**CLO-3** ***Level-4***

Items	Laptops	Books	Plants	Jackets	Gadgets
Weight	15	22	30	25	18
Value(USD)	195	242	270	300	120

Identify the optimal selection of items to include in each box to maximize the total value while respecting the weight capacity constraints. Consider that you can take fractions of items if needed.

"Be confident in Yourself."

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: 1.30 Hrs **Marks: 25**

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.		**Scenario 1: Library Management System:** A public library has several branches across different cities in Bangladesh. Each branch is identified by a unique branch number, along with its street, city, state, zip code, and phone number. The daily operations of the branch are managed by a librarian or a team of staff, each assigned a staff number, name, position, and salary. Each branch maintains a collection of books. Information stored for each book includes a catalog number, book number, title, genre, daily rental fee, cost, availability status, and the names of the authors and publisher. Multiple copies of the same book can be found at a branch, and individual copies are distinguished using the book number. Before borrowing a book, individuals must register as library members by providing their member number, first and last name, address, and the date they joined the library. Once registered, a member can borrow up to five books at a time. For each borrowed book, details such as rental number, member name and number, book number, title, rental fee, and the dates borrowed and returned are recorded. A unique rental number tracks all transactions across the library network.		
	a)	Identify schema for the above mentioned scenario 1.	**[Marks-4]**	**CLO-1** ***Level-4***
	b)	Analyze the three levels of abstraction for the library management system	**[Marks-3]**	
	c)	Examine the key responsibilities of a Database Administrator in ensuring data integrity and consistency when managing in the company's database?	**[Marks-3]**	
2.	***a)***	Illustrate an Entity Relationship Diagram identifying their entity, attributes & relationship using scenario 1.	**[Marks-4]**	**CLO-2** ***Level-4***
	b)	From this scenario 1, point out candidate key, primary key, alternate key, foreign key, and Composite key with explanation.	**[Marks-2]**	
		c) Consider the following Schema and **Solve** with Relational Algebra for the following questions. **Branch**(branch_number, street, city, state, zip_code, phone_number) **Staff**(staff_number,name,position, salary, branch_number) **Video**(catalog_number, video_number, title, category, daily_rental, cost, status, branch_number) **Member**(member_number, first_name, last_name, address, registration_date, branch_number)	**[Marks-4]**	

number greater than 'B050'

b) Find out the first names and last names of members who are registered at branches with a branch number 'B101' and 'B102'.

c) Retrieve the title and category of all videos that have a daily rental fee greater than 30.

d) Find all members who registered in the year 2023.

3.

Emp_ID	Emp_name	Emp_address
E101	Alif	Mirpur
E102	Raihan	Uttara
E103	Rani	Mirpur
E104	Mila	Savar
E105	Alamin	Uttara
E106	Maisha	Savar
E107	Azmi	Farmgate

Employee

Project_ID	Emp_ID
P1	E103
P2	E104
P3	E105
P4	E103
P5	E104
P6	E107

Project

a)	**Solve SQL command to express each of the following queries:** I. Create those two tables using key constraints II. Insert data into above two tables. III. Add a new column Emp_salary in the employee table using the alter command and Project_start_date in the Project table. IV. Delete the column Emp_address from the employee table. V. Rename the column name Emp_ID as Employee_Id from the employee table.	**[Marks-5]**	**CLO-3** *Level-3*

Daffodil International University

Department of Software Engineering
Faculty of Science & Information Technology
Midterm Examination, Fall 2024
Course Code: SE 232; Course Title: Operating System & System Program
Sections & Teachers: 40(A-I), BH, IS, SSD

Time: 1 Hour 30 Mins **Marks: 25**

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.		You are the lead systems architect at **QuantumTech**, a company that's developing a new class of smart drones. These drones are equipped with sophisticated hardware, including real-time image processing units. The drones operate on a custom-built, real-time operating system that employs dual-mode operation to manage system resources and handle critical tasks such as flight control, real-time image processing, and communication with ground stations.		
	a)	**Describe** how the dual-transition mode of an operating system works for the task.	**[Marks-5]**	**CLO-1** ***Level-1***
	b)	**State** how many queues are maintained to represent the process scheduling?	**[Marks-5]**	
2.	***a)***	You're a software developer working on a new project, simultaneously using your computer for multiple tasks. Each task gets enough fixed CPU time to function smoothly. **Demonstrate** the operating system of your work environment.	**[Marks-5]**	**CLO-2** ***Level-3***
	b)	**Apply** the Round Robin CPU Scheduling algorithm (**quantum=2**) considering the scenario and calculate the average waiting time and turnaround time. 10.83, 7.33	**[Marks-5]**	
	c)	**Apply** the preemptive version of the scheduling algorithm based on priority for the above scenario to find out the average waiting time and turnaround time. (High Priority = 1)	**[Marks-5]**	

PID	Arrival Time	Burst Time	Priority
P1	0	4	5
P2	1	5	2
P3	2	2	1
P4	3	1	5
P5	4	6	4
P6	6	3	3

Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Final Examination, Fall 2024

Course Code: SE 221; Course Title: Object Oriented Design

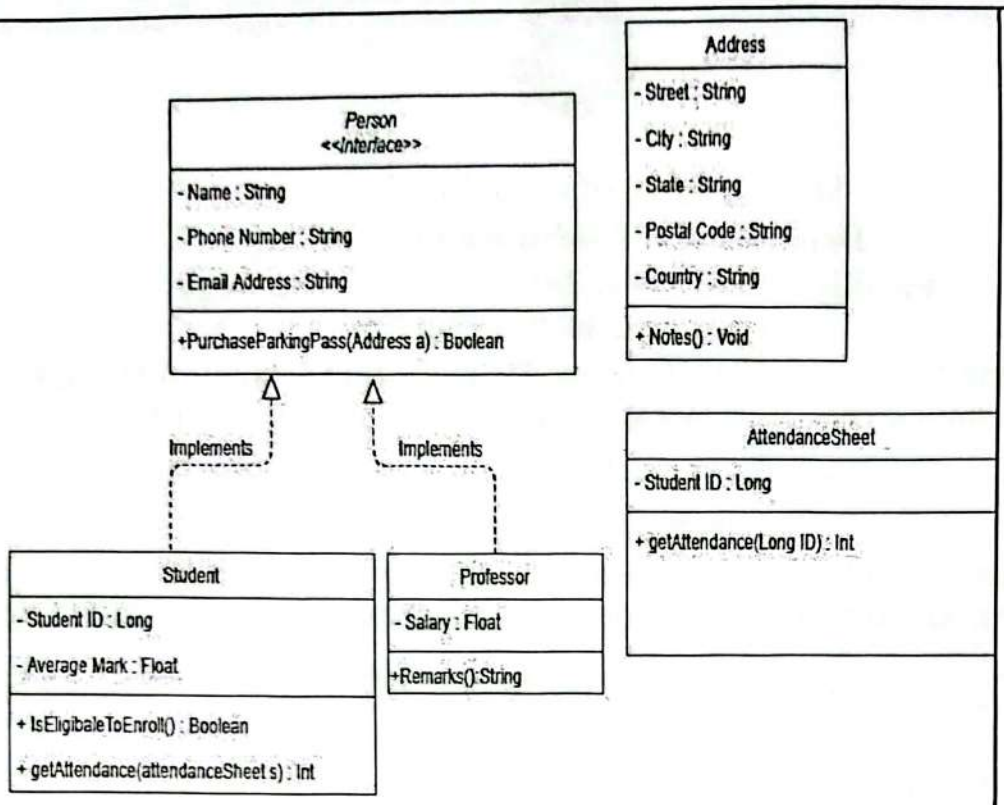
Sections & Teachers: [40(A-C)]AG, [40(D-G)]MBH, [40(H-I)]DB

Time: 1:30 Hrs **Marks: 25**

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)*	Suppose you have to develop a Car booking System for an online platform. All bookings have attributes like a bookingID, customerName, destination , pickUpPoint and approximateCost. But only Premium users can instantly book a vehicle.The Diamond users can set the speed limit for the ride. In this system, one premium or Diamond user can book a vehicle for later which is not available for normal users and this type of booking will provide a discount of 20% from the current fare. Diamond users can play movies during the journey where premium users can play music only. Consider the above scenario and **picturize** a complete class diagram with standard notations. Please remember, you can not disclose the data of one end to another	**[Marks-10]**	**CLO-1** *Level-2*
2.	*a)*	In Q1, have you used any kind of Object oriented concept among the 4 pillars? Demonstrate the need of these concepts with some other code examples.	**[Marks-3]**	**CLO-3** *Level-3*
	b)	When can we use try, catch and finally blocks in JAVA? Examine with a proper scenario while creating an object.	**[Marks-2]**	

3.	a)	 **According to the above class diagram, Figure out proper working code segments together. Must build the main method in a different class and inside the main method, make the object of each class.**	[Marks-8]	CLO-2 *Level-4*

	b)	**Figure out the output of the following code**
		
		`class Vehicle{`
		`  void drive(){`
		`  System.out.println("Driving my vehicle...");`
		`  }`
		`  void speedUp(){`
		`  System.out.println("Speeding up my Vehicle...");`
		`  }`
		`}`
		`class Car extends Vehicle{`
		`  void drive(){`
		`  System.out.println("Driving a car...");`
		`  }`
		`}`
		
		`class Main{`
		`  public static void main(String[] args){`
		`  Vehicle v = new Car();`
		`  v.drive();`
		`  v.speedUp();`
		`  Car c = new Vehicle();`
		`  c.drive();`
		`}`
		`}`
			[Marks-2]	

Daffodil International University
Department of Software Engineering
Faculty of Science & Information Technology
Midterm Examination, Fall-2024
Course Code: GE-235, Course Title: Principles of Accounting, Business & Economics
Level: 2 Term: 2 Section: All
Instructor: SAS, FAA

Duration: 1 Hour and 30 minutes **Marks: 25**

Answer all the questions

Question 1: **Marks: 2*2 = 4**

a) What is accounting equation? Explain with proper example. **[CLO 2, Level 2]**
b) Discover the following short notes:
(i) Depreciation (ii) Unearned Service Revenue **[CLO 2, Level 3]**

Question 2: **Marks: 8**

Mr. Kapil has started a new business named "Kapil Firm" on June 1, 2023. During the first month of the operation of his business, the following events and transactions occurred:

June 1	Invested Tk. 52,000 cash & Tk. 18,000 furniture in the business.
June 5	Purchased office supplies from Doyel Company for Tk. 3, 800 and paid cash Tk. 2,200.
June 7	Withdrew Tk. 3,500 cash for personal use.
June 9	Service performed for cash Tk. 28,000 and billed to the customer for Tk. 12,000.
June 15	Purchased office furniture for cash Tk. 17,000 and received a bill for Tk. 5,000.
June 23	Paid Tk. 800 due in transaction (5).
June 28	Monthly expenses on account: advertising expense Tk. 2,500 & Utilities bills Tk. 800.
June 30	Received full amount for due in transaction (9).

Instruction:

Explain the given data to prepare a tabular summary and income statement for the month ended June 2023. **[CLO 1, Level 2]**

Question 3: **Marks: 7**

Mr. Shopnil is the owner of Biswas Agency, started its operation on 1st July, 2023. The following information is related with the operations of June, 2022:

July 1: Invested cash Tk. 65,000 & equipment for Tk. 28,000 in the business.

July 5: Purchased office supplies from Lovello Company for Tk. 4,500 & paid in cash.

July 15: Purchased furniture for cash Tk. 22,000 and received a bill for Tk. 8,000.

July 20: Incurred advertising expenses of Tk. 12,300 on account.

July 24: Paid monthly expenses: Rent Tk. 8,800 & Utilities bills Tk. 1,700.

July 30: Service performed for Tk. 18,000 & received cash Tk. 8,000.

Requirements:

a. Generalize the above transactions by journalizing them. **[CLO 1, Level 2]**
b. Clarify the journal entries by preparing the following ledger accounts:
   i) Cash (ii) Accounts payable

Question 4: **Marks: 6**

Mr. Sabbir started his Accounting Firm, Padma Accounting Firm, on June 1, 2023. The trial balance at 30 September, 2023 is as follows:

Padma Accounting Firm

Trial Balance

30 September, 2023

Details	Debit (Tk)	Credit (Tk)
Cash	30,000	
Accounts Receivable	16,000	
Prepaid Insurance	9,000	
Supplies	16,000	
Office furniture	90,000	
Accounts Payable		18,000
Unearned Service Revenue		27,000
Owner's Capital		55,000
Notes Payable		45,000
Service Revenue		40,000
Salaries expense	20,000	
Rent Expense	4,000	
	185,000	185,000

Other data:

1. One third of the supplies have been remain unused.
2. The Insurance policy is for 30 months.
3. Tk. 2,800 of unearned service revenue has been earned during this period.
4. Annual depreciation of office furniture is Tk. 12,000.
5. Salaries expense is accrued Tk. 3,200 per month.
6. The note payable interest rate is 10%. The note payable was issued at 1st August, 2023.

Requirements:

Examine the above information in preparing the adjusting entries. **[CLO 2 Level 3]**

Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Midterm Examination, Fall 2024

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

Sections & Teachers: 40 (All);

Md Hafizul Imran(HI); Masrufa Tasnim (MT); Md. Sefatullah (MS)

Time: 1 Hour 30 Mins **Marks: 25**

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 following terms: i. Resolution, ii. Photoconductive Effect	**[Marks-2]**	**CLO-1** ***Level- 2***
	b)	Are "Accuracy" and "Precision" of a sensor indicating the same characteristics? **Explain** your answers using necessary logic and diagrams if needed.	**[Marks-3]**	
	c)	Bangladesh is rapidly adopting automation and robotics in various sectors, including manufacturing, healthcare, and agriculture. As more industries in Bangladesh begin to rely on robots, it is crucial to ensure that these machines operate safely and ethically. Now, Agricultural robots are used to plant and harvest crops in rural areas of Bangladesh. **Describe** how do the Three Laws help balance efficiency with the safety of farmers working alongside these robots?	**[Marks-5]**	
2.		Consider a smart home system designed to enhance safety through the following functionalities: The system is equipped to detect temperature and presence of sunlight and by detecting these it automatically controls the lights, fans and ac inside the house Additionally, the system is capable of detecting fire within the kitchen, issuing an alert in the event of a fire accident.		
	a)	**Express** which sensors will be suitable to design the smart home system described in the given scenario. Provide a detailed description of their operational processes and underlying principles.	**[Marks-6]**	**CLO-2** ***Level-3***
	b)	If you want to turn on a RED light or LED when there is fire, how may you design the circuit for this part? Only **prepare** the circuit for the fire detection and red led alert system. **Program** the necessary Arduino code to develop this system.	**[Marks-6]**	
	c)	To make a robot which is mobile or moving, it is necessary to install motors and wheels. To measure the distance covered by the robot over a specific duration, an Encoder Sensor can be used. Given the following parameters: • The encoder provides 32 counts per revolution. • The installed wheel has a radius of 10 cm. • The encoder records 40 counts in 5 minutes, **Calculate** the distance the robot has traveled in 15 minutes if it has a uniform velocity.	**[Marks-3]**	