Daffodil International University
Department of Software Engineering
Faculty of Science & Information Technology
Midterm 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: 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)	You are a robotics engineer tasked with designing an autonomous cleaning robot for household use. The robot, named RoboClean, is equipped with advanced AI algorithms to navigate and clean efficiently. However, during the development phase, you encounter a dilemma where RoboClean must make a decision that potentially violates one of Asimov's Three Laws of Robotics. Consider the following scenario:	[Marks-2+3 +5=10]	CLO-1 *Level- 2*
		RoboClean is programmed to clean the house thoroughly while ensuring the safety and well-being of humans. One day, while cleaning the kitchen, RoboClean detects a hazardous spill of a corrosive substance on the floor. Simultaneously, it also detects a frail elderly person in another room who appears to be in distress, possibly due to a fall. RoboClean can only attend to one task at a time, and both situations require immediate attention. i. **Define** Robot and Robotics. ii. **Identify** and **explain** the potential conflict RoboClean faces in adhering to Asimov's Three Laws of Robotics based on the provided scenario. iii. **Explain** the ethical considerations involved in RoboClean's decision-making process and propose a course of action that prioritizes human safety while addressing the competing demands of the situation.		
2.	a)	You are designing an encoder sensor system for a robotic arm in a manufacturing plant. The encoder sensor is responsible for accurately measuring the rotation of the arm's joint. The sensor provides a digital output corresponding to the angular position of the joint, with a resolution of 360 counts per revolution. Suppose the robotic arm completes 5 full revolutions clockwise and then 3 full revolutions counterclockwise. Solve the total number of	[Marks-5]	CLO-2 *Level-3*

		counts registered by the encoder sensor during this movement sequence.		
	b)	**Design** a circuit diagram and **write** Arduino code to autonomously control an RGB LED for a dynamic lighting system. The circuit should include components for the RGB LED, appropriate resistors (if necessary), a microcontroller (such as Arduino Uno), and any other necessary components. The code should initialize the pins connected to the RGB LED and implement a sequence to cycle through RED, GREEN and BLUE colors with a delay of 0.5 seconds.	[Marks-5]	
	c)	You're tasked with creating a simple robot capable of navigating and avoiding obstacles in its environment. The robot needs to incorporate two types of sensors: one for detecting nearby objects and another for measuring distances. These sensors will enable the robot to perceive its surroundings and make informed decisions to avoid collisions. **Design** a robot suitable for the described scenario, detailing the components required to implement obstacle detection and avoidance functionalities. Explain how the chosen sensors will enable the robot to navigate effectively without direct human intervention.	[Marks-5]	

Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Mid-Term Examination, Spring 2024 @ Daffodil Smart City

Course Code: SE221, Course Title: Object-Oriented Design

Level: 3; Term: 1; Section: All;

One hour thirty minutes (1:30 hrs); Marks: 25

Directions:

- **Texts in square brackets indicate Course Learning Outcomes and Bloom's Taxonomy Level**

Suppose you have to develop a Course Management System for an online platform. All courses have attributes like a CourseID, CourseName, TargetStudents , CompletionHistory and UsualCost. But only free courses don't have any cost or zero cost. Also, the Premium courses have the "Vatted cost" as an attribute where 15% vat is added on the UsualCost. The Timed courses should have a time limit as a method.

In this system, after completion of any course, it should automatically generate a certificate. Only Premium courses should provide 3 types of certificates such as "Super Fast Learner", "Fast Learner" , "Moderate Learner". The timed courses should not be providing a certificate if it is not completed on time.

Answer the following questions: *[CLO 2, PLO 2] 10 Marks*

Q1. Consider the above scenario and **picturize** a complete class diagram with standard notations.

Q2. Answer the short questions

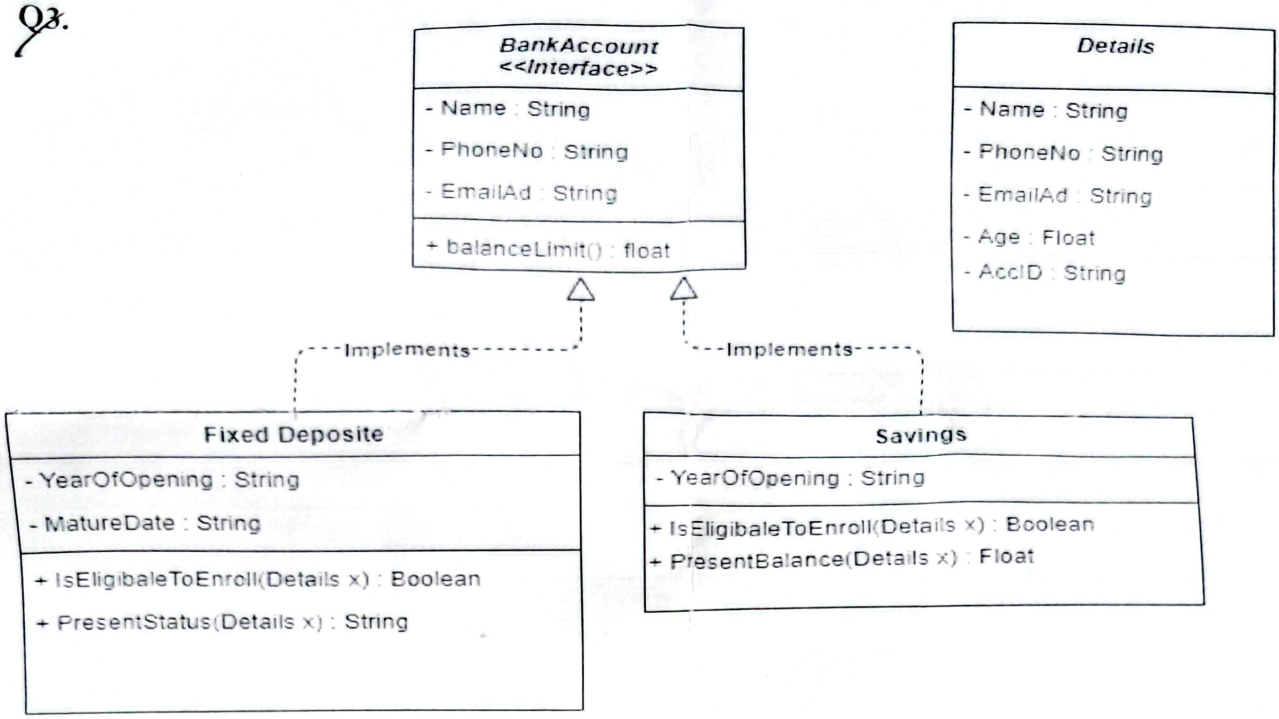
a. In **Q1**, Have you used any kind of Object Oriented concept ? **Demonstrate** the need of these concepts?

[CLO 3, PLO 3] 3 Marks

b. Why can we not access a variable which is declared in some other scope in JAVA? **Examine** with a proper scenario?

[CLO 3, PLO 3] 2 Marks

Q3.



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.

[CLO 1, PLO 4] 8 Marks

➢ Create all required classes with necessary properties, attributes, and methods with proper relations among classes. [4]
➢ Ensure proper OOP concepts to develop your classes. [2]
➢ Use necessary keywords. [2]

b) **Explore the output of the following code** **2 Marks**

```
class Vehicle{
    void drive(){
        System.out.println("Driving a vehicle...");
    }
    void speedUp(){
        System.out.println("Speeding up a 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();
    }
}
```

Note: You must write the output following the order.If you think the code produces an error, mention the reason.

Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Midterm Examination, Spring 2024

Course Code: SE 232; Course Title: Operating System & System Programming

Sections & Teachers: 38(A,B), 39(A,B,C,D); SSD, BH, IS

Time: 1 Hour 30 Minutes **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)	**Define** the characteristic and hierarchical structure of the traditional Unix system with the diagram.	Marks 5	CO1, PO2, L1
	b)	**State** the factors which contribute to a process transitioning from the ready state to the running state in an operating system.	Marks 5	CO1, PO2, L1
2		Consider the following set of processes, with the length of the CPU burst is given in milliseconds.		

Process ID	Arrival Time	Burst Time
P1	5	10
P2	4	6
P3	3	7
P4	1	9
P5	2	2
P6	6	3

	a)	**Apply** the Round Robin CPU Scheduling algorithm (**quantum=3**) considering the scenario and calculate the average waiting time and average turnaround time with the gantt chart.	Marks 5	CO2, PO1, L3
	c)	**Apply** the non-preemptive version of scheduling algorithm (which focuses on the burst time) for the above scenario to find out average waiting time and average turnaround time with the gantt chart. Compare the average value and identify the better algorithm for above processes.	Marks 5	CO2, PO1, L3
	c)	**Explain** the benefits of using multi thread and classify the best multithreading model used in the operating system.	Marks 5	CO2, PO1, L3

Daffodil International University
Department of Software Engineering
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Midterm Examination, Spring 2024
Course Code: SE 223; Course Title: Database systems
Sections & Teachers: All
Time:1:30-3:00PM Date: 20-03-2024
Marks: 25

Answer ALL Questions

1.		A Video Rental Company has several branches throughout Bangladesh. Each branch has the branch address made up of a branch number, street, city, state, and zip code, and the telephone number. Each branch is allocated staff or Manager. The Manager or staff is responsible for the day-to- day running of a given branch. Each staff member is given a staff number,name, position, and salary. Each branch has a stock of videos. The data held on a video is the catalog number, video number, title, category, daily rental, cost, status, and the names of the main actors, and the director. However, in most cases, there are several copies of each video at a branch, and the individual copies are identified using the video number. The status indicates whether a specific copy of a video is available for rent. Before hiring a video from the company, a customer must first register as a member of a local branch. The data held on a member is the member number, first and last name, address, and the date that the member registered at a branch. Once registered, a member is free to rent videos, up to a maximum of ten at any time. The data held on each video rented is the rental number, the full name and number of the member, the video number, title, and daily rental, and the dates the video is rented out and date returned. The rental number is unique throughout the company.		CLO-1, Level-2]
	a)	**Describe** relational database and tables for the above system	[Marks-2]	
	b)	**Explain** data abstraction for the above mentioned system	[Marks-3]	
	c)	**Distinguish** between schema & instance for the above management system.	[Marks- 3]	
	d)	**Clarify** at least four functions of database administrator.	[Marks- 2]	
2.	*a)*	Consider the question 1's scenario. **Generate** an ERD identifying their entity, attributes & relationship.	[Marks-4]	CLO-2 *Level-3*

b) [Marks- 2]

Table: Customer

Customer_id	Customer_name	Address
101	Rumman	Savar
102	Anik	Dhanmondi
103	Polash	Tejgaon
104	Suha	Agargaon
105	Mikel	Dohar
106	Mika	Farmgate

Table: Order

Order_id	Order_date	amount	Customer_id
111	2002-02-22	2520 Tk	103
112	2019-02-09	13478 Tk	104
113	2022-12-06	521 Tk	102
114	2019-10-09	9200 Tk	411
115	2017-07-29	1440 Tk	600
116	2022-09-12	520 Tk	105

From this schema, **choose`** candidate key, primary key, alternate key, foreign key, and Composite key with explanation.

c) [Marks-4]

Consider the relation for **Question b. Solve** relational algebra for the following questions.

a. Find all customer name who yet not give any order,

b. Find the customer name who gives the order on 2017-07-29.

c. Find the customer information who lives in Savar.

d. Find all customer IDs who are ordered.

3. [CLO-3, Level-3]

Student

Student Name	Course Id	Title	Term
Shahin	121	Structured Programming	T1-L2
Rupa	122	Structured Programming Lab	T1-L2
Jui	311	Design pattern	T2-L3
Miraj	223	Database	T2-L2
Bina	333	Null	Null

Course

CourseId	Course Fee	Dept Name
121	10000	SWE
111	8000	CIS
311	12000	SWE
224	5000	SWE
124	4500	BBA

a) Show the results of inner join, full outer join for the table Student and Course [Marks- 2]

b) [Marks-3]

Solve SQL command to express each of the following queries:

I. Create those two tables using constraints

II. Insert data into those dates.

III. Add a new column **credit** in the course table using the alter command.

Daffodil International University
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Midterm Examination, Spring-2024
Course Code: GE-235, Course Title: Principles of Accounting, Business & Economics
Level: 2,3 Term: 2,1 Section: All
Instructor: SK,MRI,DAR,AN,FAA Date: 18.3.24 Time: 1:30-3:00 pm
Duration: 1 Hour 30 minutes **Marks: 25**

Answer all the questions

Question 1: **Marks: 2.5*2 = 5**

a) Who are the external users and in taking which type of decision Economic planners use accounting information- Explain with example . *[CLO 1, Level 2]*
b) Describe the following short notes:
(i) Prepaid Expense (ii) Revenue Recognition Principle *[CLO 1, Level 2]*

Question 2: **Marks: 7**

Joan Robinson opened her own law office on July 1, 2023. During the first month of operations, the following transactions took place:

Jul 1 Joan invested $15,000 cash and $ 5,000 of Furniture in the business.
4 Paid $700 for July rent on office space.
9 Purchased Supplies of $14,000 of which $5,000 on cash.
17 Borrowed $700 cash from a bank on a note payable.
22 Performed legal services for client on account $4,000.
28 $5,000 of the accounts payable is paid for credit purchase of supplies on July 9.
29 Receipt of $2,000 for service provided on July 22.

Instruction:

Classify the given data to prepare a tabular analysis *[CLO 1, Level 4]*

Question 3: **Marks: 8**

Mr. Kader Khan started Khan Repair Shop on 1st August, 2022. The following information is related to the operations of August, 2022:

August 1: Invested $40,000 cash and Equipment of $5,000 in the business.
3: Purchased a used van of $10,000 by paying 70% cash.
7: Performed repair services of $4,000 cash.
15: Received cash of $8,000 in advance from Mr. X to provide repair service.
16: Paid for a 2-year insurance policy of $2,000.
20: Provided repair services and billed customers of $2,500.

22: Received advertising bill of $1,000 to be paid next month.

Requirements:

a. Construct the above transactions by journalizing them. *[CLO 1, Level 3]*
b. Use the journal entries in preparing the following ledger accounts:
i)Cash (ii) Accounts payable

Question 4: Marks: 5

Mr. Jafar Ali started his Accounting Firm, Ali Accounting Firm, on October 1, 2022. The trial balance at 31st December, 2022 is as follows:

Ali Accounting Firm

Trial Balance

31st December, 2022

Details	Debit (Tk)	Credit (Tk)
Cash	10,000	
Accounts Receivable	16,000	
Prepaid Insurance	6,000	
Supplies	6,000	
Office furniture	90,000	
Accounts Payable		18,000
Unearned Service Revenue		7,000
Ali, Capital		45,000
Notes Payable		25,000
Service Revenue		40,000
Salaries expense	3,000	
Rent Expense	4,000	
	135,000	135,000

Other data:

1. One third of the supplies have been used.
2. The Insurance policy is for 2 years.
3. Tk. 2200 of unearned service revenue has been earned during this period.
4. Annual depreciation of office furniture is Tk. 9,000.
5. The note payable is a note payable of 6 months with 12% interest per annum. The note payable was issued at 1st October, 2022.

Requirements:

Examine the above information in preparing the adjusting entries. *[CLO 2 Level 4]*

Daffodil International University

Department of Software Engineering
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Midterm Examination, Spring 2024
Course Code: SE 214; Course Title: Algorithm Design and Analysis
Sections & Teachers: FE (L-2, T-2: A, B & C), MHS (L-2, T-2: D)

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)
```
void generate_primes(int n) {
    printf("Prime numbers up to %d:\n", n);
    for (int num = 2; num <= n; num++) {
        if (is_prime(num))
            printf("%d ", num);
    }
    printf("\n");
}
```
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 and determine the dominant factor affecting the overall time complexity. — 2 — CLO1, PLO2, C4

(b)
```
void bubble_sort(int arr[], int size) {
    for (int i = 0; i < size - 1; i++) {
        for (int j = 0; j < size - i - 1; j++) {
            if (arr[j] > arr[j + 1]) {
                int temp = arr[j];
                arr[j] = arr[j + 1];
                arr[j + 1] = temp;
            }
        }
    }
}
```
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. — 3

2. (a) Convert the array [170, 45, 75, 90, 802, 24, 2, 66] in ascending order using Radix Sort. Explain the intermediary steps, including the distribution of elements into buckets and their recombination, for each digit position during the sorting process. — 5 — CLO2, PLO1, C2

b) When dealing with a dataset that is nearly sorted, with only a few elements out of place, which algorithm would exhibit better performance: Insertion Sort or selection sort? Explain your reasoning behind your choice, taking into account the characteristics and efficiency of each algorithm. 5

c) Compare the time complexity of Quick Sort and Merge Sort in the worst-case scenario. Which algorithm demonstrates better performance in terms of time complexity, and what factors contribute to this difference? 5

3. As a software developer tasked with optimizing logistics for a delivery company. Analyze to scenario and explain how you would utilize the greedy fractional knapsack algorithm to allocate packages to trucks for optimal delivery. Elaborate on the key steps involved in implementing this algorithm to maximize the total value of deliveries while ensuring that each truck does not exceed its weight capacity. 5 *CO3, PO2, C4*