Student ID: ____

Full Names: ____

Midterm Exam – Part 2

(October 2025)

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1. The time allotted for completing the entire exam (both Parts 1 and 2) is $2^1/_2$ hours.
2. **This Exam belongs to MIU CS Department and must not be taken away, or copied or photographed or reproduced or transferred or shared or distributed. Any violation will be penalized.**

Make sure to include the screenshots of your work/results, where required.

Midterm Exam – Part 2 (110 points)

Part 2: Software Requirements, Analysis, Design and Implementation (110 points)

1. (20 points) Git/Github Skills

Assume you have been hired as a Software Developer for a project which is hosted on Github at the repository url: https://github.com/okalu/cs489-apsd-202510-midterm-repo. And you have been assigned to work on a new feature for issuing Apartment Leases for a national real estate management company.

You are required to perform the following tasks:

1. Obtain a copy of the project repository from github on to your local machine

2. To work on the 'Create a new Lease feature, create a new branch named,

your-name_feat_register-new-lease

3. Add a Java (or C# or Python etc) source code file named, LeaseRegistrationService.java and you enter into it, the following lines of code as:

```
public class LeaseRegistrationService {
        public void createNewLease() {
                System.out.println("Hello, New Lease created!");
        }
}
```

4. Commit your change(s) to the new branch

5. Next, merge the changes from the new branch to the main branch

6. Finally, send a Pull Request with the feature you have added, for review and acceptance by the project team lead, on the project repository on github.

For submission, take a screenshot of your work (i.e. screenshot(s) of your Command terminal window showing your git commands executed, and screenshot(s) of github page(s) showing the repository and your addition(s)).

Put your screenshot images (.png or .jpg files only) into a single zip file which you upload here, as your submission.

Note: ***When you take the screenshots, it should be full screenshot(s) of your computer showing your entire computer screen (NOT a snippet or a window)***

Guide: To take full screenshot of your computer, do this:

On Windows, press the Windows key + PrintScreen key; and then get the image file from your 'Pictures' folder. Or use the Snipping tool or Press PrtScr key, open Paint or Microsoft Word and paste the screen image (Ctrl + V) and save the file, zip it all and upload the zip file.

On MacOS, press the key combination: Cmd + Shift + 3

2. (90 points) Software Requirements Analysis, Data modeling, Database Design and Implementation

Consider the problem statement/description given below.

Your tasks for this question will include:

- Perform Analysis and Domain modeling to create a Domain model UML Class diagram for the Software solution.

- Perform Data modeling and create an E-R model for the database needed for the system. You may draw the E-R diagram using a graphical drawing tool on computer or draw by hand using paper and pen/pencil.

- Implement your model onto a physical Database

- Write and execute Queries for the requirement given

Problem Statement/Description:

Royal Windsor Realty, LLC are a national Real Estate Management company who own and manage residential apartment homes in properties located in cities across the country.

Assume that the company has hired you, as a Software Developer, to design and develop an application software for their Apartments Leasing Management system, which they will be using to manage data about their **Apartment**s, the **Lease**s and the **Tenant**s who are the lease-holders. They want you to develop a basic Command-Line Interface (CLI) App (or Web App or Web API) for this purpose.

An important need for the company managers is to be able to view the list of all Apartments that they own and manage. And also to see the Revenue (income) that accrues from the Leases.

An Apartment is a residential accommodation that can be rented-out through the issuance and signing of a Lease agreement.

A Lease is an agreement or contract issued to a rental customer, known as a "Tenant", which allows the tenant to occupy, live and reside in a specific Apartment for a given period.

For this CS489 Midterm Exam Part2 Question, it is given that:

An **Apartment** is located at an **Address**. And one Address can only be associated to one Apartment.

An Apartment will have many Leases.

A **Lease** can be associated with only one Apartment.

A **Tenant** will have one or more Leases.

A Lease can only be issued to just one Tenant, as the lease-holder. And every Lease must be associated to a Tenant.

Note: It is possible that some Apartment(s) may NOT have had any Lease, for example, if it is in a newly constructed property and so has not yet been rented-out. However, every Lease must be associated with an Apartment. The system MUST NOT have a Lease without an Apartment associated. In other words, there CANNOT be a Lease for an unknown Apartment.

Also, every Lease MUST be associated to a Tenant, who is the lease-holder. There SHOULD NOT be a Lease for an unknown Tenant. Likewise, every Tenant MUST have at least 1 lease, that they have signed in order to become a tenant.

IMPORTANT: For the purpose of this CS489 Midterm Exam, your solution/domain model should consist of the following four (4) entity classes, named:

1. Apartment
2. Address
3. Lease
4. Tenant

Here are the attributes for the **Apartment** entity, including some useful descriptions and/or sample data values:

Apartment:

apartmentId: Integer, (Primary Key field)

apartmentNumber, (required field)

propertyName, (required field)

floorNo (optional field)

size (in square feet)

numberOfRooms

Here are the attributes for the **Address, Tenant and Lease** entities, including some useful descriptions and/or sample data values:

Address:

apartmentNumber,

street,

city

state

zipCode

Tenant:

firstName (required field)

lastName, (required field)

phoneNumber, (required field)

Email (optional field)

Lease:

leaseId: (Primary Key field)

leaseNumber: (Required field, Unique)

startDate: (required)

endDate: (required)

monthlyRentalRate: (required) e.g. $1,750, $2,500 etc.

Data:

Here is the company's data, which you are expected to input/load into your database for the system:

Address data: (Note: This is NOT necessarily the Database table)

Address Id	Apartment Number	Street	City	State	Zip Code
1	K1210	123 West Avenue	Phoenix	AZ	85012
2	B1109	900 Johns Street	Cleveland	OH	43098
3	G815	123 West Avenue	Phoenix	AZ	85012

Apartments data: (Note: This is NOT necessarily the Database table)

Apartment Id	Apartment Number	Property Name	Floor No	Size (sq feet)	Rooms
1	K1210	Bells Court	12	1,150	2
2	B1109	The Galleria	11	970	1
3	G815	Bells Court	8	1,150	2

Tenants data: (Note: This is NOT necessarily the Database table)

First Name	Last Name	Phone No	Email	Lease(s)
Robert	Lanskov	(480) 123-1355		1, 3, 4
Anna	Smith	(414) 998-0112	asmith@mail.com	2

Leases data: (Note: This is NOT necessarily the Database table)

Lease Id	Lease Number	Start Date	End Date	Monthly Rental Rate	Apartment Id
1	D0187-175	2021-10-1	2022-9-30	1,750.00	1
2	W1736-142	2022-8-15	2024-2-14	1,500.00	2
3	DD001-142	2022-10-1	2023-9-30	1,975.00	1
4	P162-0017	2023-10-1	2024-9-30	2,275.00	1

For this question, you are required to do the following tasks:

TASK 1: Domain modeling

Draw the Domain model UML class diagram for the solution. Your diagram must show the four Domain entity Classes, the Attributes, Relationship(s) and Multiplicities etc.

TASK 2: Database Design and E-R modeling

Create an E-R model for the database needed for the system. You may draw the E-R diagram using a graphical drawing tool on computer or draw by hand using paper and pen/pencil.

TASK 3: Database implementation

Implement your E-R model on a physical Relational (or Non-relational) database. Use any RDBMS (or NoSQL DB) of your choice e.g. MySQL, PostgreSQL, MongoDB etc. Make sure to implement ALL the requirements as given in the specification above. E.g. Required fields, Unique fields etc.

TASK 4: Data

Populate the Database with all of the company's given data

TASK 5: Implement and execute Queries

Write and execute Queries for the following requirements:

- Display the list of ALL the Apartments registered in the system, including the full Address data for each Apartment. The list should be sorted in descending order of the apartment sizes (in sq feet) and ascending order of the Apartment number.
- Display the list of ALL the Apartments with all their Lease(s) data, including the apartments which have not yet had any Lease. And sort the list in ascending order of the Apartment Number.
- Display a list of all the Leases in the system, including a column (which you should name, revenue_earned) that shows the Revenue (i.e. amount of income) that accrued to the company for each lease.

Submissions for the above tasks:

Task 1: Save or export the UML diagram to a .PNG or .JPG image file, which you include in your zip file for submission/upload. Or hand-in your hand-drawn diagram.

Task 2: Save or export the E-R model diagram to a .PNG or .JPG image file, which you include in your zip file for submission/upload. Or hand-in your hand-drawn diagram.

Task 3: Save (or export) ALL the SQL DDL Code in a filenamed, MyCS489MidtermDBScript.sql which you include in your zip file for submission/upload. Or you make & take screenshots of your Database design/implementation work.

Task 4: Save (or export) ALL the SQL DML Code in a filenamed, MyCS489MidtermDBDataPopScript.sql which you include in your zip file for submission/upload. Or you make & take screenshots of your Database data population work.

Task 5: For each of the Queries, execute your code and take a screenshot of your computer showing your code and the output result, and save/export it to a .PNG or .JPG image file, which you include in your submission. Or save the Query into a .sql file which you include in your zip file for submission/upload.

Enjoy!

//-- The End --//