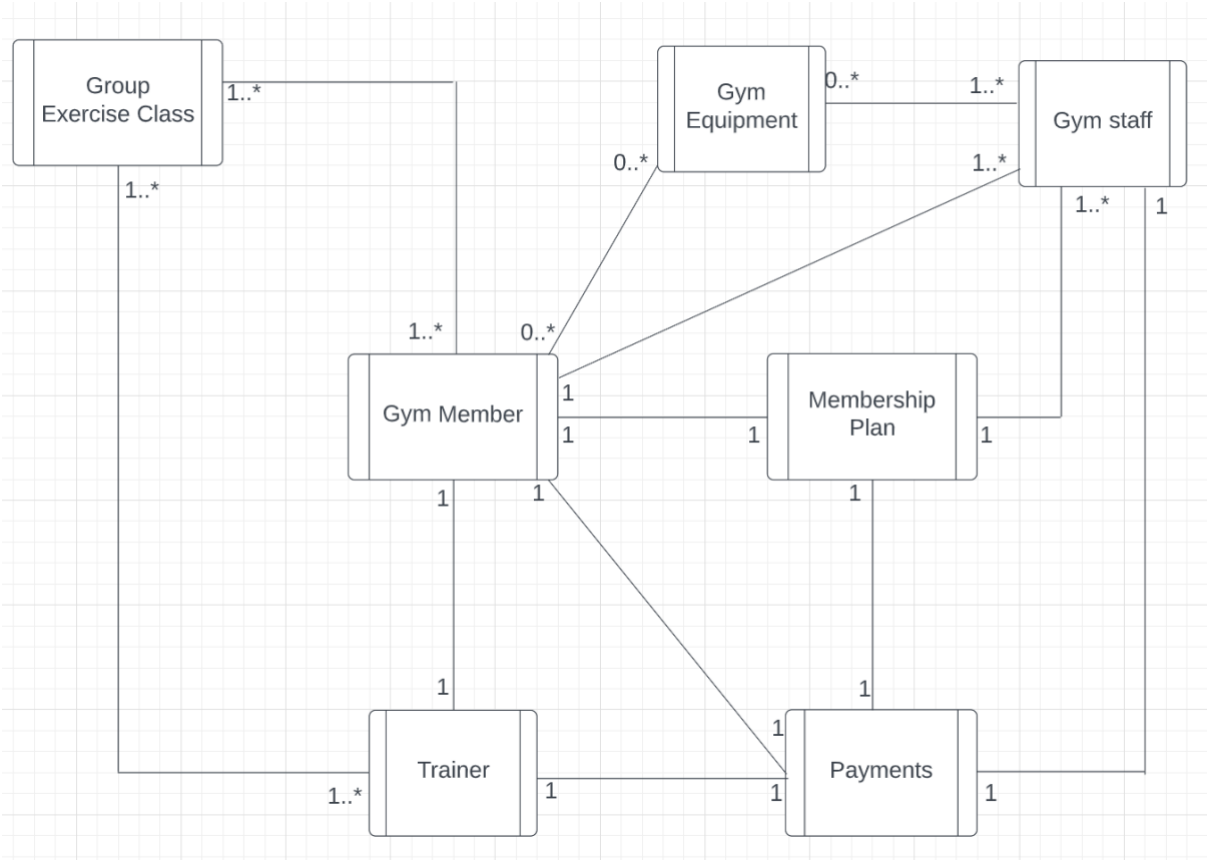
1. Requirements Analysis and Conceptual Modelling - The business is Fitness First Gym.

Q1. A set of requirements in natural language (English). This is a short text explaining what your system needs to do. The text needs to be concise and rigorous.

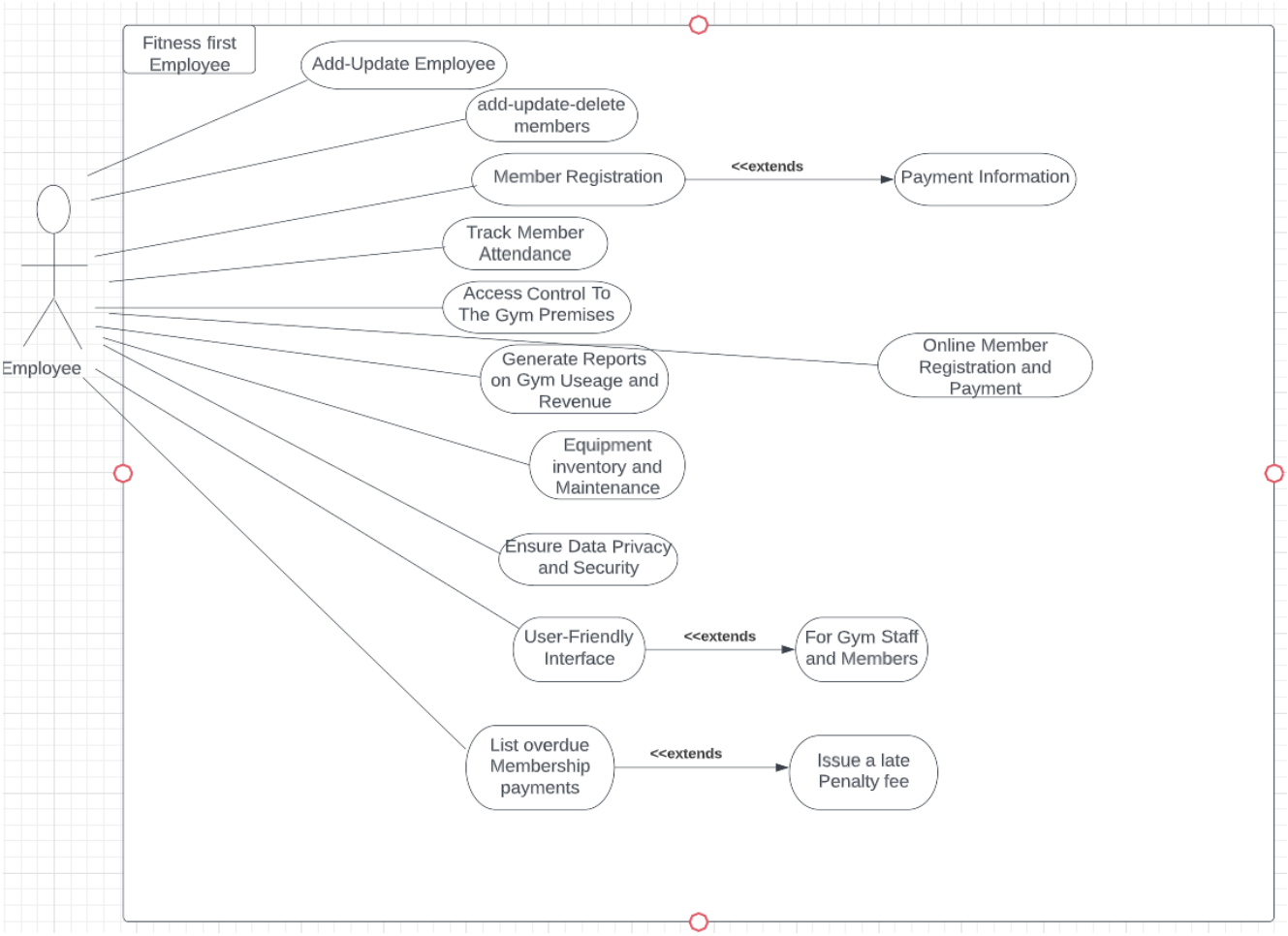
1. The gym system must manage member registration and payment information.
2. The gym system must provide access control to the gym premises.
3. The gym system must track member attendance.
4. The gym system must generate reports on gym usage and revenue.
5. The gym system must allow for the scheduling of classes and personal training sessions.
6. The gym system must manage equipment inventory and maintenance.
7. The gym system must provide a user-friendly interface for both gym staff and members.
8. The gym system must ensure data privacy and security.
9. The gym system should allow for online member registration and payment.
10. The gym system should provide mobile access control to the gym premises.
11. The gym system should send notifications to members about their attendance and upcoming classes or personal training sessions.
12. The gym system should integrate with fitness trackers or other health devices or track members progress.
13. The gym system could offer online classes and personal training session reservations.
14. The gym system could integrate with social media platforms to promote gym events and specials.
15. The gym system could provide personalised workout plans for members.
16. The gym system could offer virtual classes or personal training sessions.
17. The gym system won't provide medical advice or diagnosis.
18. The gym system won't guarantee member results or outcomes.
19. The gym system won't allow access to unauthorised individuals.

Q2. An essential class diagram in UML. The essential class diagram identifies the entities (with one class per entity) in the domain of interest, as well as the relationships amount them (represented as associations with their multiplicities) but leaving out the operations and the attributes. This constitutes a high-level conceptual model of your system, representing the domain of interest of said system.



2. Responsibilities with CRC Cards

Q1. A use case diagram in UML. This should be derived straight from the functional part of the requirements you wrote in Part 1.



Q2. CRC Cards for all classes (entities) in the essential class diagram you wrote in Part 1. The cards are produced by “crossing” the use case diagram with the essential class diagram.

Membership plan	
Responibilities	Collaborations
Define the terms and conditions of a gym membership plan. Determine the duration of the membership plan. Calculate the cost of the membership plan based on its duration and other factors. Define the restrictions and benefits of the membership plan, such as the number of gym visits allowed per week or access to certain gym facilities. Update the membership plan information if necessary.	**Member:** The MembershipPlan class collaborates with the Member class to assign a membership plan to a gym member. **Payment:** The MembershipPlan class collaborates with the Payment class to charge the appropiate fee for the membership plan. **Gym Facility:** The MembershipPlan class collaborates with the GroupExerciseClass and GymEquipment class to determine which facilities are included in the membership plan. **Gym Staff:** The MembershipPlan class collaborates with the GymStaff class to approve and update the membership plans offered by the gym.

Gym member	
Responibilities	Collaborations
Register for membership at the gym. Schedule and attend fitness classes and personal training sessions. Check-in and out of the gym using an ID card or app. Update personal information, such as contact details and health status Set fitness goals and track progress using the gym's software Make payments for membership, classes, and services Follow gym rules and etiquette.	**Gym Staff:** Interacts with staff to schedule appointments, make payments, and report issues or concerns. **Fitness Instructors:** Collaborates with instructors to recieve guidance and support in achieving fitness goals. **Other Gym Members:** May work out with other members or participate in group fitness classes together.

Gym Staff	
Responibilities	Collaborations
Manage and maintain member information and memberships. Assist members with inquiries, complaints, and issues Monitor and manage gym equipment and facilities. Enforce gym rules and regulations Schedule and organise fitness classes and personal training sessions. Keep track of inventory and restock supplies as needed.	**Member:** Interacts with members to provide assistance and maintain information and memberships. **Gym Equipment:** Monitor and manage gym equipment to ensure its proper functioning and maintenance. **Fitness Intructor:** Collaborate with fitness instructors to schedule and organise fitness classes and personal training sessions. **Inventory Manager:** Coordinate with the inventory manager to keep track of inventory and restock supplies as needed.

Trainer	
Responibilities	Collaborations
Design workout plans and routines for gym members based on their goals and fitness levels. Provide guidance and support to gym members on proper exercise techniques, equipment usage, and safety precautions. Monitor gym members' progress and adjust their workout plans as needed. Maintain up-to-date knowledge to fitness and health trends, as well as industry standards and regulations. Collaborate with other trainers and staff members to create a positive and welcoming gym enviornment.	**Gym Member:** Interacts with gym members to provide personlised training and support. **Gym Equipment:** Uses gym equipment to demostrate proper usage and technique to gym members. **Receptionist:** Works with receptionist to schedule training sessions and manage gym member information. **Other Trainers:** Collaborates with other trainers to design workout plans and routines, share knowledge, and provide backup support when needed.

Payments	
Responibilities	Collaborations
Process payments from gym members for membership fees, personal training session, and other services. Keep accurate records of payments, including amounts, dates, and payment methods. Provide receipts and confirmations of payment to gym members. Send reminders to gym members when payments are due or overdue. Collaborate with other system components, such as membership management and accunting, to ensure accurate and efficent payment processing.	**Gym Member:** Interacts with gym members to process payments **Membership Management:** Collaborates with membership management to ensure accurate and up-to-date membership information and pricing **Accounting:** Collaborates with accounting to ensure accurate financial reporting and compliance with regulations. **User Interface:** Provides a user-friendly interface for gym members to view and manage their payment information.

Gym Equipment	
Responibilities	Collaborations
Keep track of the equipment's availability for use by gym members. Record usage information, such as the time the equipment was used and by whom. Monitor the condition of the equipment and schedule maintenance as needed. Provide information to the gym management system about equipment usage and maintenance needs. Allow gym members to reserve equipment in advance.	**Gym Management System:** Recieves information about equipment usage and maintenance needs, and can use this informatinn to optimise gym operations. **Gym Member:** Use the equipment and interact with it to reserve it and provide usage information. **Maintenance Team:** Performs maintenance tasks on the equipment as scheduled or when needed.

Group Exercise Classes	
Responibilities	Collaborations
Schedule and coordinate exercise classes. Keep track of class attendance and waiting lists. Assign instructors to classes and manage their schedules. Provide information about classes to the gym management system for marketing and scheduling purposes. Keep track of the equipment's availability for use by gym members. Notify gym members about upcoming classes and any changes to the schedule.	**Gym Management System:** Recieves information about class schedules and attendance, can use this information to optimise gym operations. **Gym Member:** Attend classes, provide feedback on the classes, and interact with the system to sign up for classes or add themselves to waiting lists. **Instructors:** Teach classes and interact with the system to view their schedules, update class information, and communicate with gym members. **Waiting List Management System:** Manages the waiting lists for classes, notifying gym members when spots become available.

3. Operation Specification

Q1. The list of operations to be implemented in the system, at a finer grain than the use cases. Each operation will be documented by a few words that explain what the operation does. You should use names that are as explanatory as possible for the operations.

1. AddMember(): Add a new member to the gym system.
2. RemoveMember(): Remove a member from the gym system.
3. UpdateMemberInfo(): Update the information of a member.
4. AddMembership(): Add a membership plan to a member (e.g. name, address, phone number, bank details).
5. RemoveMembership(): Remove a membership plan from a member's account.
6. RenewMembership(): Renew a membership plan for a member.
7. CheckMembershipStatus(): Check the status of a member's membership plan.
8. CheckIn(): Records that a member has checked in at the gym.
9. CheckOut(): Records that a member has checked out of the gym.
10. RecordPayment(): Records a payment made by a member (e.g. for a membership plan, personal training session).
11. ScheduleClass(): Schedule a group fitness class.
12. CancelClass(): Cancel a scheduled group fitness class.
13. RegisterForClass(): Register a member for a group fitness class.
14. CancelClassRegistration(): Cancel a member's registration for a group fitness class.
15. SchedulePersonalTraining(): Schedule a personal training session for a member.
16. CancelPersonalTraining(): Cancel a scheduled personal training session for a member.
17. RecordPersonalTraining(): Record that a personal training session has taken place and the progress made.
18. ViewMemberActivityHistory(): view a member's activity history (e.g. check-in and check-out times, class attendance, personal training sessions).
19. ViewClassSchedule(): View the schedule of group fitness classes.
20. ViewPersonalTrainingSchedule(): View the schedule of personal training sessions.

21. ViewMembershipPlan(): View the available membership plans and their details.
22. ViewMemberDetails(): View the details of a specific member's account.

Q2. The detailed specification for at least three, non-trivial operations. Each specification can be given in the form of a decision table, an activity diagram or in a controlled English / pseudo-code.

This is pseudo-code for membership plan.

```
add registerNewMember(personalDetails, membershipPlanDetails) {
  get uniqueMembershipID = generateUniqueMembershipID();
  set("members." + uniqueMembershipID + ".personalDetails", personalDetails);
  set("members." + uniqueMembershipID + ".membershipPlanDetails",
membershipPlanDetails);
  get sendConfirmationEmail(uniqueMembershipID);
  get uniqueMembershipID;
```

This is pseudo-code for group exercise class.

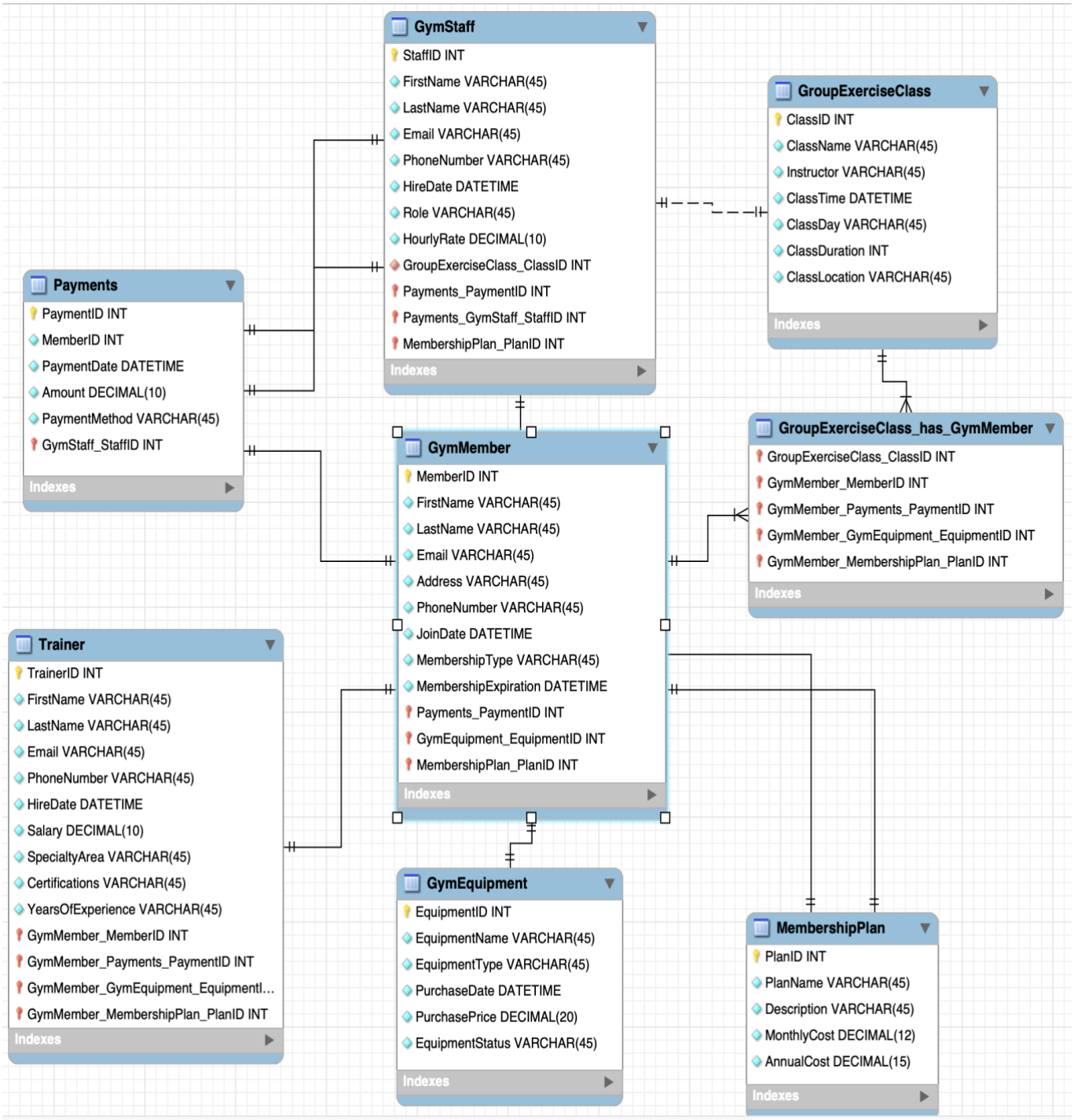
```
add scheduleFitnessClass(classDetails) {
  if (fitnessClass is full): {
    set reservedSpots = reserveSpots(classDetails);
    set instructor = assignInstructor(classDetails);
    set("classes." + classDetails.date + "." + classDetails.time, {
      "classType": classDetails.classType,
      "instructor": instructor,
      "reservedSpots": reservedSpots
    });
    get sendConfirmationMessage(reservedSpots, instructor);
  } else: {
    get sendClassFullNotification();
  }
}
```

This is pseudo-code for gym equipment.

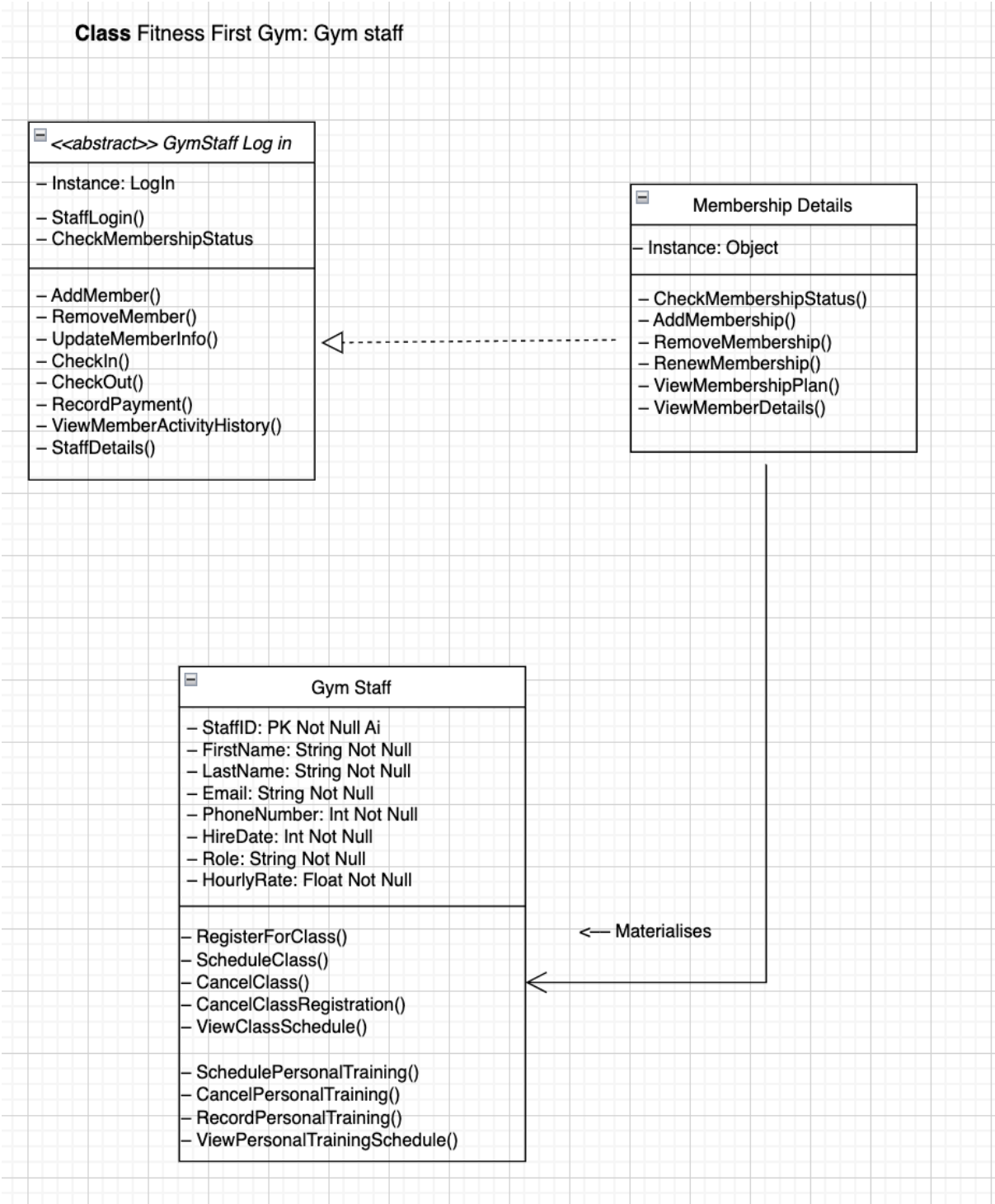
```
add checkEquipmentAvailability(equipmentType, dateTime) {
  if (theGym is open) {
    set availableEquipment = getAvailableEquipment(equipmentType, dateTime);
    if (availableEquipment.length > 0) {
          get availableEquipment;
}   else: {
          get print("No equipment available");
    }
  }  else: {
          get print("Gym is closed at this time");
  }}
```

4. Persistence Design

Q1. The relational schema for the persistent data that your system needs to store. This will be a reflection mostly of the essential class diagram you produced in Part 1, obviously with the representation of all properties/attributes of the class (which are not represented yet in the essential class diagram), whose information is found in the requirements set of Part 1.



Q2. One broker class associated to an entity class of your choice among those in the essential class diagram. This must be represented in UML, and must have individual operations, which will have to reflect the responsibilities of the entity class, among those identified in Parts 2 and 3, that operate on persistent data



5. User Interface Design

Q1. An essential UI prototype for one major UI element of your system. This would be normally a paper-based prototype, with sticky notes moved around until UI elements are placed, without details, in the design of the UI; in your case, you will include a figure (produced with tools of your choice, including hand-drawing) in the report?

Q2. A high-level UI flow diagram related to the part of the UI necessary to one of the operations you have specified in Part 3.