School of Electrical Engineering & Computing
University of Newcastle
SENG2130 – Systems Analysis and Design
Workshop 7 Object Design (week 9)

1. Draw a class diagram representing the application domain facts below, and map it to a relational schema.

   • A project involves a number of participants.
   • Participants can take part in a project either as project manager, team leader, or developer.
   • Within a project, each developer and team leader is part of at least one team.
   • A participant can take part in many projects, possibly in different roles. For example, a participant can be a developer in project A, a team leader in project B, and a project manager in project C. However, the role of a participant within a project does not change.

2. Consider the following design goals. For each of them, indicate the candidate pattern(s) you would consider to satisfy each goal:

Adapter pattern, Bridge pattern, Strategy pattern

• Given a legacy banking application, encapsulate the existing business logic component.
• Given a chess program, enable future developers to substitute the planning algorithm that decides on the next move with a better one.
• Given a chess program, enable a monitoring component to switch planning algorithms at runtime, based on the opposing player's style and response time.

3. Consider a system that includes a database client and two redundant database servers. Both database servers are identical: the first acts as a main server, the second acts as a hot back-up in case the main server fails. The database client accesses the severs through a single component called a "gateway," hence hiding from the client which server is currently being used. A separate policy object called a "watchdog" monitors the requests and responses of the main server and, depending on the responses, tells the gateway whether to switch over to the back-up server.

   What do you call this design pattern? Draw a UML class diagram to justify your choice.

4. Consider an existing game of bridge.
   We are interested in integrating this bridge game into ARENA. Which design pattern would you use? Draw a UML class diagram relating the ARENA objects with some of the classes you would expect to find in the bridge game.

5. Consider a workflow system supporting software developers.
   The system enables managers to model the process the developers should follow in terms of processes and work products. The manager can assign specific processes to each developer and set deadlines for the delivery of each work product. The system supports several types of work products, including formatted text, picture, and URLs. The manager, while editing the workflow, can dynamically set the type of each work product at run time.

   Assuming one of your design goals is to design the system so that more work product types can be added in the future, which design pattern would you use to represent work products?

6. Consider an application that must select dynamically an encryption algorithm based on security requirements and computing time constraints.

   Which design pattern would you select? Draw a UML class diagram depicting the classes in the pattern and justify your choice.