RedId _____

Answer all 18 questions. Answer essay questions as briefly as possible.

The following might be names of patterns: Abstract Class, Abstract Factory, Active Object Model, Adapter, Application Controller, Bridge, Builder, Chain of Responsibility, Collaborator, Command, Composite, Decorator, Dependency Injection, Dynamic Factory, Façade, Factory Method, Flyweight, Interpreter, Iterator, Master-Slave, Mediator, Memento, Null Object, Observer, Prototype, Proxy, Singleton, Schema, Smart Variables, Specification, State, Strategy, Template Method, Value Object, Visitor.

1. (16 pts.) For each item below give **only one** design pattern that allows the following aspect to vary
   a) Families of product objects

   b) How a composite object gets created

   c) The interface to an object

   d) Interface to subsystem

   e) Storage costs of objects

   f) How an object is accessed

   g) The object that fulfills a request

   h) How and which objects interact with each other

2. (10 points) Design patterns have consequences, some good and some bad.

   a. Give one good consequence of the Observer pattern.

   b. Give one bad (or negative) consequence of the Observer pattern.

3. Give **only one** answer to each of the following five questions.
   a) (2 points) What design pattern would you use to make it easy to change the implementation of an abstraction?

   b) (2 points) What design pattern would you use when you have a group of related objects that are designed to work together and you need to insure that they are used together?

   c) (2 points) What design pattern might you use when you wish to reduce tight coupling between classes?

   d) (2 points) What design pattern should you think of when you want to hide how you construct a complex object?

   e) (2 points) Which design pattern would you use when you want to specify at runtime which method to use to satisfy a request? Give only one pattern.

6. (10 points)
   a. What is the difference between an object adapter and a class adapter?

   b. What is an advantage of an object adapter over a class adapter?

7. (10 points) Explain the plugin pattern.

8. (10 points) The Proxy, Bridge and Adapter share a similar structure. What is the difference between the patterns?

9. (8 points) What is the goal (or intent) of the following patterns.
   a) Prototype

   b) Singleton

10. (10 points) What is the Liskov Substitution Principle. Give an example.

11. (10 points) Explain how the Mediator pattern works.

12. (10 points) Some design patterns can be described as changing the skin of an object others can be described as changing the guts of an object. What design pattern(s) would be considered changing the skin of an object?

13. (10 points) In the builder pattern why does the client retrieve the product from the concrete builder instead of the director?

14. (10 points) The hardest part of the prototype pattern is implementing clone operation. What are the issues in implementing the clone operation?

15. (10 points) Explain the difference between intrinsic and extrinsic state of an object.