

Red ID _____

Answer all 12 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, Extension Object, Façade, Factory Method, Flyweight, Interpreter, Iterator, Master-Slave, Mediator, Memento, MVC, Null Object, Observer, Property, Prototype, Proxy, Singleton, Schema, Smart Variables, Specification, State, Strategy, Template Method, Type Object, 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) Under which conditions would one use the builder pattern?

3. (11 points) Circle the correct answer for each of the following.

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|------|-------|---|
| True | False | Abstract Factory is often implemented as a singleton. |
| True | False | The Builder pattern uses an interface/abstract class to define the products it builds. |
| True | False | The composite pattern does not allow parent pointers. |
| True | False | Abstract factories are often implemented with factory method. |
| True | False | The class adapter is commonly used in Java. |
| True | False | In the bridge pattern one still needs an abstract implementer class if there's only one implementation. |
| True | False | An abstract factory can be used in the bridge pattern. |
| True | False | The Composite pattern is often used in the interpreter pattern. |
| True | False | Component-parent link in the composite pattern can be used for a change of responsibility. |
| True | False | Façade objects can be singletons. |
| True | False | A request is guaranteed to be handled in the Chain of Responsibility. |

4. (8 points) What is the goal (or intent) of the following patterns.

a) Proxy

b) Factory Method

5. (10 points) In the builder pattern why does the client retrieve the product from the concrete builder instead of the director?

6. (10 points) In the abstract factory pattern supporting a new family of products is easy but supporting new kinds of products is difficult. Explain why this is.

7. (10 points) The hardest part of the prototype pattern is implementing clone operation. What are the issues in implementing the clone operation?

8. (10 points) The adapter and the bridge pattern have similar structure. What are the major differences between the two patterns.

9. (5 points) Give one the advantage that the class adapter has over an object adapter.

10. (10 points) Explain how the bridge pattern can be used to keep client code platform independent when building applications with GUIs.

11. (10 points) Explain the difference between intrinsic and extrinsic state of an object.

12. (5 points) What is the Law of Demeter trying to prevent?