University College Dublin
An Coláiste Ollscoile, Baile Átha Cliath

SEMESTER 2 EXAMINATION – 2010/2011

COMP 30160

Object-Oriented Design

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Time Allowed: 2 hours

Instructions for candidates

Answer any three questions.
All questions carry equal marks.

Question 1

Consider the following scenario. You are a software engineer with several years experience of working on projects that used the Waterfall model for software development. Six months ago you started work with a new company that uses Extreme Programming (XP) as its development methodology.

Write an account of your experiences in this new environment, comparing and contrasting your present experiences of XP with your previous work.

Your account should demonstrate that you understand the two methodologies mentioned above, and that you appreciate the differences between them. You are encouraged to describe fictitious events and experiences to enhance your account. You may adopt any position you wish, pro-XP or anti-XP or somewhere in between, so long as your position is supported by informed argument.

(20 marks)

Question 2

(a) Consider the following code:

```
class Clock {
  public void updateTime(int secs){seconds=secs;}
  public int getSeconds(){return seconds;}
  private int seconds;
}
class ClockWatcher {
  public …;
  private int seconds;
}
```

Update both classes so that a `ClockWatcher` object can be informed when the `seconds` field of a given `Clock` object is updated, and subsequently update its own `seconds` field. Aim for a flexible solution. You may add new classes in your solution.

(10 marks)

(b) Explain, using examples, the following Object-Oriented Design principles:

(i) open-closed principle

(ii) no concrete superclasses principle

(10 marks)

Question 3

(a) For each of the following design patterns, draw a class diagram for the typical structure of the pattern, state the intent of the pattern and describe the dynamics of the pattern:

(i) Factory Method

(ii) Abstract Factory

From your experience, describe a context in which Factory Method could be used and a context in which Abstract Factory could be used.

(10 marks)

(b) Describe briefly each of the principal UML models, viz:

Use Case model
Class model
Interaction model

Explain the purpose of each of these models when analysing using UML, and explain how these models relate to each other. What aspects of a system *cannot* be described using these models?

(10 marks)

Question 4

(a) Draw a UML class diagram to model the following description of a web forum or discussion board:

A forum comprises a number of topics and and a number of members. A member can create a topic, and can add posts to a topic, even a topic that they have not created. A post is created by exactly one member, and is part of one topic.

Some members have moderator status. A moderator is associated with a number of topics (every topic has one moderator), and can delete posts from the topic they moderate. A moderator can also assign a member a ranking on a particular topic.

Create interaction diagrams for the two use cases CreatePost (available to members) and DeletePost (available to moderators only)

(10 marks)

(b) What is the Liskov Substitution principle? What consequences has this principle on the argument types and return type of an overriding method? Demonstrate, using an example, how failure to observe these consequences can lead to type errors.

(10 marks)