

Please answer the questions in the space provided on the question sheets.

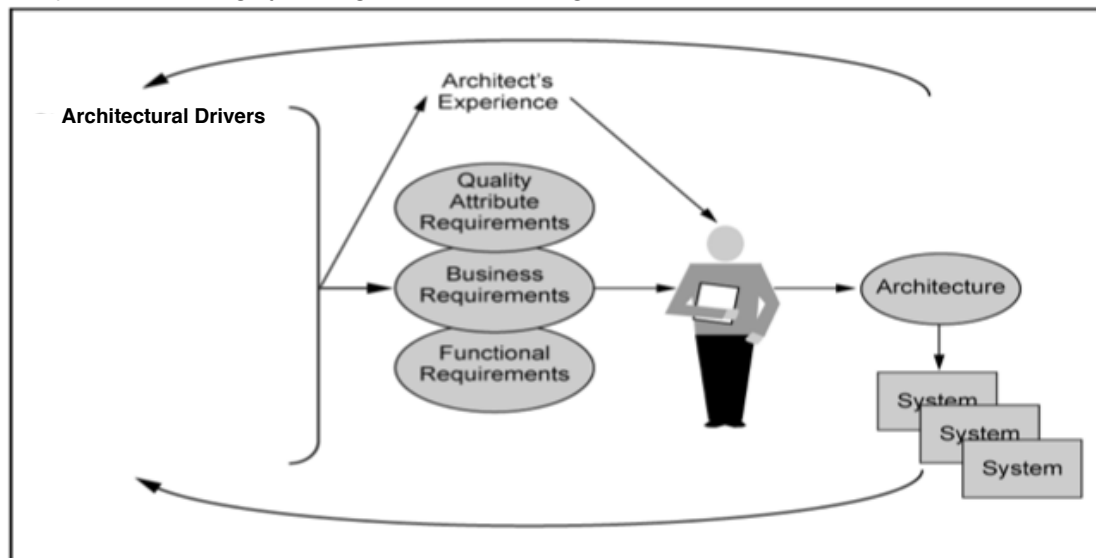
Software Architecture Exam
June - 2013

Question:	1	2	3	4	5	Total
Points:	25	20	20	20	15	100
Score:						

1. Software Architecture Principles

- (a) [8 points] The figure below shows the architecture's business lifecycle. The lifecycle goes from a number of architectural drivers, on to requirements, and from those the architect designs an architecture.

- i. Complete the drawing by writing **two** of the missing drivers.



- ii. Explain how those two drivers affect the architecture of the system.

Name & Student number:

(b) [6 points] Define and compare *Control* coupling and *External* coupling. Which one is more desirable?

- (c) [6 points] For each of the following characteristics of a system, mark whether they are a functional requirement (**FR**), a quality attribute (**QA**) or a design constraint (**DC**).

The system shall...	run on Windows and Unix	_____
	log all user logins	_____
	allow users to buy and sell stocks	_____
	be implemented in Java version 7	_____
	display stock quote changes within one second	_____
	have a unit test coverage > 85%	_____

- (d) [5 points] For the following System Quality attributes, mark whether they belong to the end user view (**EU**), developer view (**D**) or the business community view (**BC**).

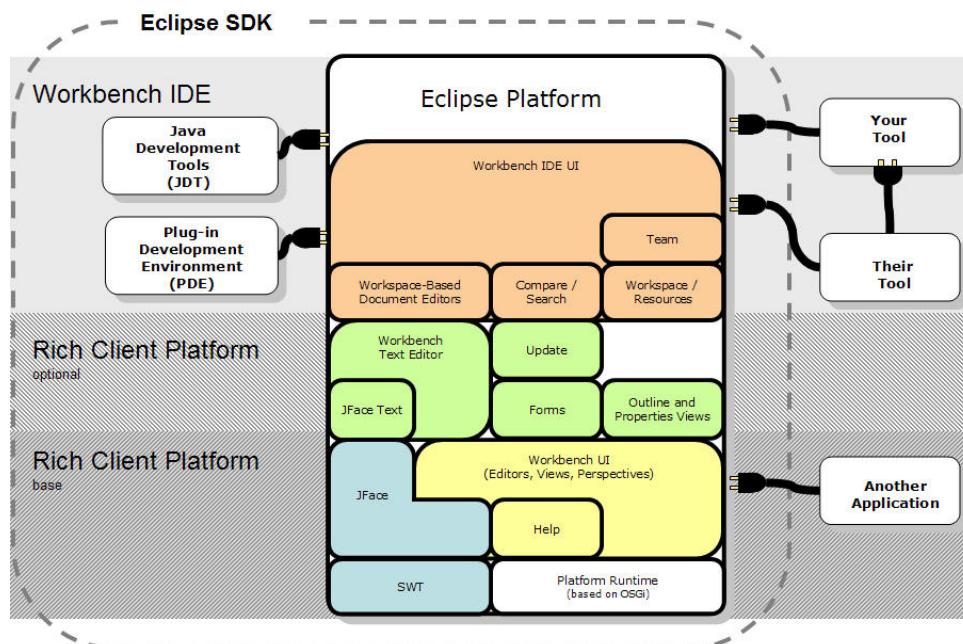
Performance	_____
Maintainability	_____
Time to market	_____
Reusability	_____
Usability	_____

2. Architectural Styles

Consider the following description and architectural diagram of the Eclipse SDK:

Each subsystem in the platform is itself structured as a set of plug-ins that implement some key function. Some plug-ins add visible features to the platform using the extension model. Others supply class libraries that can be used to implement system extensions. The Eclipse SDK includes the basic platform plus two major tools that are useful for plug-in development. The Java development tools (JDT) implement a full featured Java development environment. The Plug-in Developer Environment (PDE) adds specialized tools that streamline the development of plug-ins and extensions.

Taken from Eclipse Platform Development Guide



Name & Student number:

- (a) [10 points] Using the diagram, explain the architectural styles *Microkernel* and *Layers*.

- (b) [10 points] Explain how the following quality attributes are (positively or negatively) impacted when a layered microkernel architecture is used:

Maintainability

Performance

Portability

Reusability

Testability

3. **Component-Based Software Development, Service-Oriented Architecture**

- (a) [10 points] Give an example of the kind of information specified for each of the following levels of interface specification in CBSD:

Syntactic Specification

Semantic Specification

Quality of Service Specification

- (b) [10 points] Explain two differences between Components in CBSD and Services in SOA.

4. Model-Driven Engineering

- (a) [12 points] In MDE, transformations can be classified depending on whether their output is expressed in the same language as the input and on whether the output is at the same abstraction level as the input. For each of the following model transformation scenarios, state whether they are an *endogenous* or *exogenous* transformation, and whether they are *vertical* or *horizontal*.

A refactoring that moves a Java method from a class to its super class.

Generating Java classes from an UML class diagram design.

Translating a Java application to an equivalent JavaScript one.

- (b) [8 points] Explain what is meant by “*Reuse in Software Product Lines is predictive rather than opportunistic*”. Compare it to the kind of reuse provided by using classic libraries.

5. Software Quality Metrics

- (a) [5 points] Provide an informal definition of the Coupling between Object Classes (CBO) metric from the CK catalogue. What does this metric measure? How is it calculated? Explain the metric using a small example.

Name & Student number:

- (b) [5 points] The CBO metric can be used to identify quality problems in object-oriented systems. Which kind of problems can be identified? How would you use the metric to identify such quality problems?

- (c) [5 points] Suppose we have two systems A and B. For both systems we take the average value of the CBO metric (over all classes in the system). If for both systems, this average value is the same, can we then correctly conclude that both systems are of the same quality? Why (not)?