UNIVERSITY *of* LIMERICK

OLLSCOIL LUIMNIGH

COLLEGE *of* INFORMATICS *and* ELECTRONICS

Department of Computer Science
and Information Systems

End-of-Semester Assessment Paper

Academic Year:	2006/2007	Semester:	Repeats
Module Title:	Systems Analysis	Module Code:	CS4125
Duration of Exam:	2.5 Hours	Percent of Total Marks:	100
Lecturer(s):	J.J. Collins	Paper marked out of :	100

Instructions to Candidates:

- Answer Q1, and any two other questions.

Q1 Answer ALL parts. Total marks awarded for this question: 50.

a) Describe the algorithmic and non-algorithmic techniques used to document a process specification.

5 marks.

b) Draw a sequence diagram to illustrate initialisation of the Model View Controller architectural pattern.

5 marks.

c) Using qualified composition, draw a class diagram that captures the concept that a board is the *full* owner of 9 squares, with the square arranged into 3 columns and 3 rows.

5 marks.

d) Given the class diagram fragment in figure 1, what is the UML name given to the class *StaffGrade*. Modify the class *StaffGrade* to specify that a history of staff grades is maintained and accessible at runtime.

5 marks.

e) Describe what a class interface is, and its significance in software engineering. Illustrate your answer through the use of a class diagram.

5 marks.

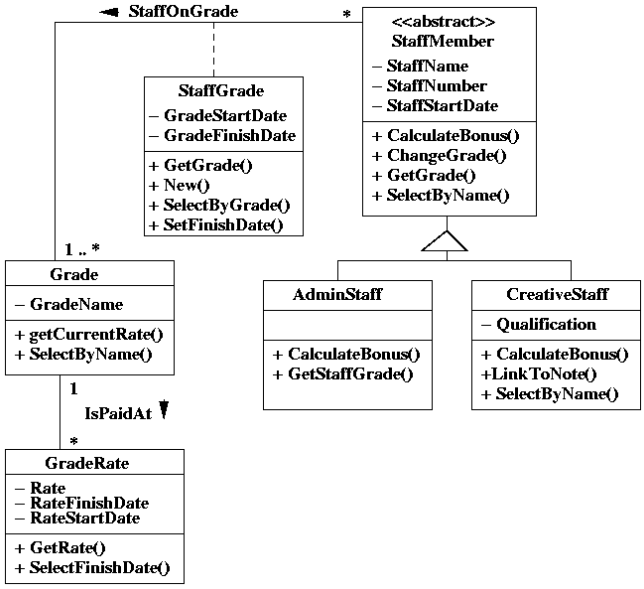

Figure 1

f) List the differences between a pattern and a framework.

5 marks.

g) What problem is addressed by Gamma et al.'s Composite structural pattern?

5 marks.

h) State the Liskov substitution principle (LSP).
If specified that mortgage accounts do not have a debit operation, whereas cheque accounts do, explain why the diagram in figure 2 violates the LSP.
Restructure this diagram to satisfy the LSP.

5 marks.

i) What are the concepts captured in a subsystem diagram, and illustrate your answer through the use of a diagram?

5 marks.

j) Discuss the difference between semantics and syntax with respect to the Unified Modelling Language, and briefly describe the importance of each to the software engineering profession.

5 marks.

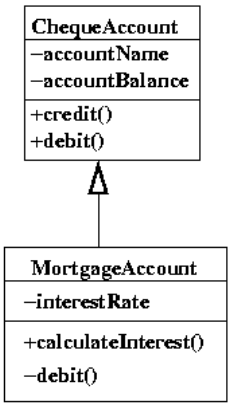

Figure 2

Q2 Answer ALL parts. Total marks awarded for this question: 25.

a) List Buschmann et al.'s (1996) categorisation of patterns.

3 marks.

b) List the activities that take place in system design.

6 marks.

c) Describe the Broker architectural pattern with proxies, and illustrate your answer through the use of a sequence diagram.

8 marks.

d) What problem is addressed by Gamma et al.'s Behavioural state pattern? Illustrate this pattern through the use of a class diagram.

8 marks.

Q3 Answer ALL parts. Total marks awarded for this question: 25.

a) Specify the difference between a component and deployment diagram.

3 marks.

b) Describe the concepts of coupling and cohesion.
Discuss how these concepts can be applied to an object-oriented, and use diagrams where appropriate to ground the discussion.

6 marks.

c) A folder consists of a set of files and folders. Operations such as rename and delete apply to folders and files. Describe a design pattern that supports the requirement that both files and folders support a uniform interface, and illustrate the answer with a class diagram.

8 marks.

d) Describe the key features of the object-oriented paradigm.
Illustrate the discussion with a diagram for at least two features.

8 marks.

Q4 Answer ALL parts. Total marks awarded for this question: 25.

a) Draw a class diagram to statically model the following example: a library holds journals and many copies of books. Students may borrow up to six copies at any one time. Staff may in addition, borrow journals.

3 marks.

b) Given the class diagram fragment in figure 3, using collection class(es) design the one-way one-to-many association *owns* between *Campaign* and *Advert*.
Only reproduce the relevant model artifacts necessary to answer the question.

6 marks.

c) Briefly describe the broker architecture, and illustrate your answer with a sequence diagram that includes client-side and server-side proxies.

8 marks.

d) Briefly describe Smalltalk's MVC architecture, and illustrate your answer through the use of a sequence diagram.

8 marks.

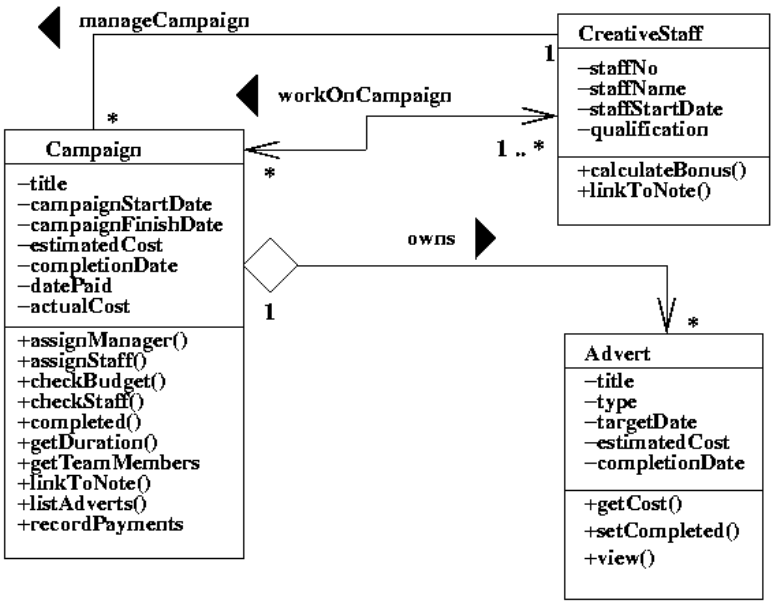

Figure 3. Class diagram fragment.