UNIVERSITY *of* LIMERICK

OLLSCOIL LUIMNIGH

COLLEGE *of* INFORMATICS *and* ELECTRONICS

Department of Computer Science
and Information Systems

End-of-Semester Assessment Paper

Academic Year:	2007/2008	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 three other questions.

Q1 Answer ALL parts. Total marks awarded for this question: 40.

a) What are the characteristics of good software?

4 marks.

b) List three common criticisms of use cases.

4 marks.

c) State the Liskov substitution principle (LSP), and illustrate your answer with the aid of a diagram.

4 marks.

d) Discuss the types of coupling and cohesion that adversely impact quality of object-oriented systems. Illustrate your answer with diagrams.

4 marks.

e) Draw a collaboration diagram to illustrate the following dynamics: a word-processor (active object) creates a print file and then asynchronously requests a print spooler (active object) to print the job. The print spooler repeatedly reads a block from the print file and sends the block to the printer (active object) using a procedure call.

4 marks.

f) Describe four interaction operators.

4 marks.

g) What are the advantages and disadvantages offered by the traditional and incremental development approaches with respect to design.

4 marks.

h) List the support features typically offered by a DBMS?

4 marks.

i) Draw a diagram that illustrates Fowler's pattern of separated interfaces..

4 marks.

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

4 marks.

Q2 Answer ALL parts. Total marks awarded for this question: 20.

a) List the major activities in system design.

5 marks.

b) Discuss the concept of software architecture making reference to at least one author. Describe the architectural views captured in your CS4125 project. Illustrate with A diagram.

5 marks.

c) Draw a class diagram that captures the concept of programming to interfaces, not implementation. What benefit is derived by adhering to this principle?

5 marks.

d) The Unified Modelling Language (UML) is a widely used modelling notation within the software engineering profession. Critique the UML in terms of liabilities and benefits.

5 marks.

Q3 Answer ALL parts. Total marks awarded for this question: 20.

a) Draw a sequence diagram using the UML to illustrate the dynamics of the broker architectural pattern.

5 marks.

b) Write coding fragments to illustrate the implementation of the singleton design pattern

5 marks.

c) What problem is addressed by Gamma et al.'s State behavioural pattern? Illustrate this pattern through the use of a class diagram.

5 marks.

d) 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..

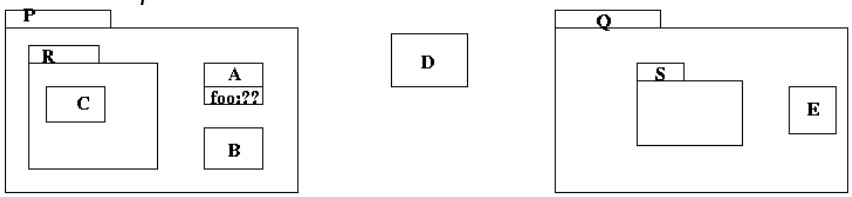
5 marks.

Q4 Answer ALL parts. Total marks awarded for this question: 20.

a) Draw a diagram to illustrate multiple classification.
What is the difference between multiple classification and inheritance.

5 marks.

b) Given the package diagram in figure 1, what are the legal and illegal choices of class for attribute *foo* in class A?



Packages and visibility examples

Figure 1.

5 marks.

c) Describe the concept of polymorphism in the object-oriented paradigm, and briefly discuss its benefits from an implementation perspective. Provide coding fragments in C++, Java or C# to illustrate discussion.

5 marks.

d) Given the class diagram fragment in figure 2, using collection class(es) design the many-to-many association *workOnProject* between *Project* and *SystemsAnalyst*. Only reproduce the relevant model artefacts necessary to answer the question.

5 marks.

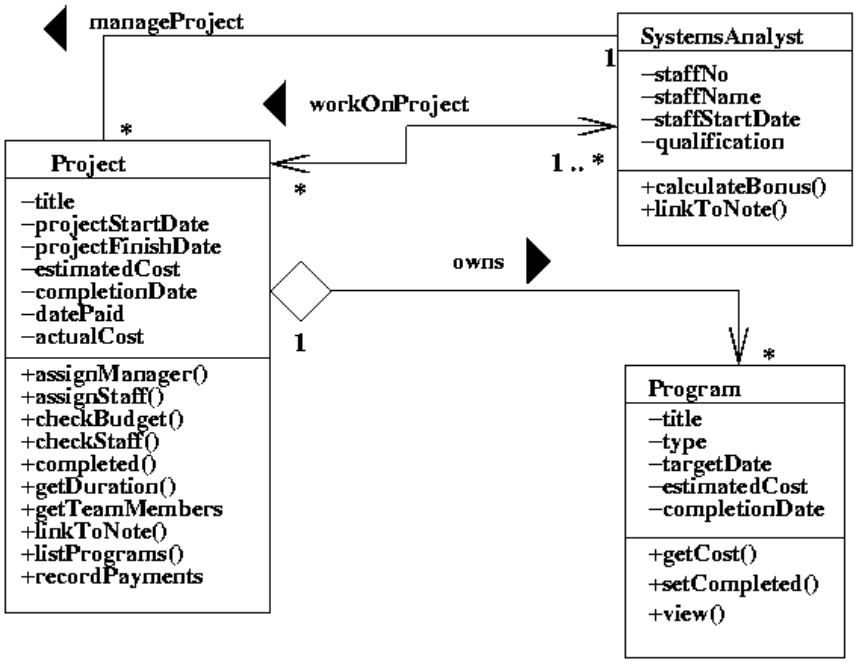


Figure 2

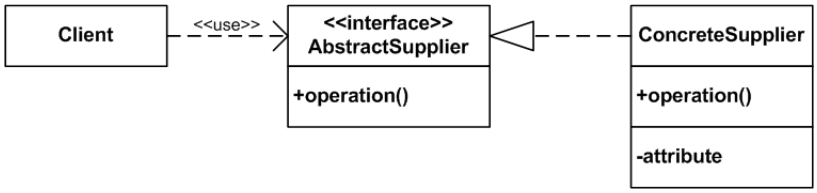


Figure 3

Q5 Answer ALL parts. Total marks awarded for this question: 20.

a) There are limitations in the design in figure 3, given that a modification request is received to add a new function to the interface provided by the abstract supplier class, to satisfy the requirements of a new client.

- Briefly discuss the limitations of this design.
- Modify the diagram to take account of the principle of decoupling of the interface hierarchy.

5 marks.

b) Identify the problems with the coding fragment in figure 4. Rewrite the code to resolve the problems identified, using dependency injection to reduce the coupling between person and address.

5 marks.

c) Describe the intent of the Model View Controller architectural pattern, and illustrate your answer through the use of a class diagram that captures it's generic structure.

5 marks.

d) Draw a sequence diagram that models generic runtime behaviour of the MVC architectural pattern.

5 marks.

```
class address
{
  private int tel;
  public void set_tel_no(int number) {tel = number;}
  public void display_tel_no() { System.out.println(" Telephone number is: " +
tel);}
};

class person extends address
{
    private int dob;
    public void set_dob(int date) { dob = date;}
    public void display_dob() { System.out.println(" Date of birth is: " +  dob);}
}

class client {

  public static void main(String args[]) {

    person p = new person();
    p.set_tel_no(12345);
    p.set_dob(121212);
    p.display_tel_no();
    p.display_dob();
    p.display_tel_no();
  }
}
```

Figure 4