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:	II
Module Title:	Systems Analysis	Module Code:	CS4125
Duration of Exam:	2.5 Hours	Percent of Total Marks:	60
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) Write sample code to illustrate how the aggregation shown in figure 1 might be implemented.

Figure 1

4 marks.

f) Describe four interaction operators.

4 marks.

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

4 marks.

h) Discuss the creational problem embodied in the coding sample in figure 2. Draw a simple class diagram to capture the impact of applying the Replace Constructors with Creation Methods refactoring technique to the code. Briefly outline the rationale underlying the diagram.

4 marks.

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

4 marks.

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

4 marks.

```
public class Loan ….

  public Loan(double commitment, int riskRating, Date maturity) {
    this(commitment, 0.00, riskRating, maturity, null};
  }

  public Loan(double commitment, int riskRating, Date maturity,
              Date enquiry) {
    this(commitment, 0.00, riskRating, maturity, expiry};
  }

  public Loan(double commitment, double outstanding,
            int riskRating, Date maturity, Date expiry) {
    this(null,commitment,outstanding,riskRating,maturity,expiry};
  }

  public Loan(CapitalStrategy capitalStrategy, double commitment,
           int riskRating, Date maturity, Date expiry) {
    this(capitalStrategy,commitment,0.00,riskRating,maturity, expiry};
  }

  public Loan(CapitalStrategy capitalStrategy, double commitment,
               int riskRating, Date maturity, Date expiry) {
    this.commitment = commitment;
    this.outstanding = outstanding;
    this.riskRating = riskRating;
    this.maturity = maturity;
    this.expiry = expiry;
    this.capitalStrategy = capitalSTrategy;

    if(capitalStrategy == null) {
      if(expiry==null)
        this.capitalStrategy = new CapitalStrategyTermLoan()
      else if (maturity == null)
        this.capitalStrategy = new CapitalStrategyRevolver()
      else
        this.capitalStrategy = new CapitalStrategyRCTL()
    }
}
```

Figure 2

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

a) List the major activities in system design.

4 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.

4 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?

6 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.

6 marks.

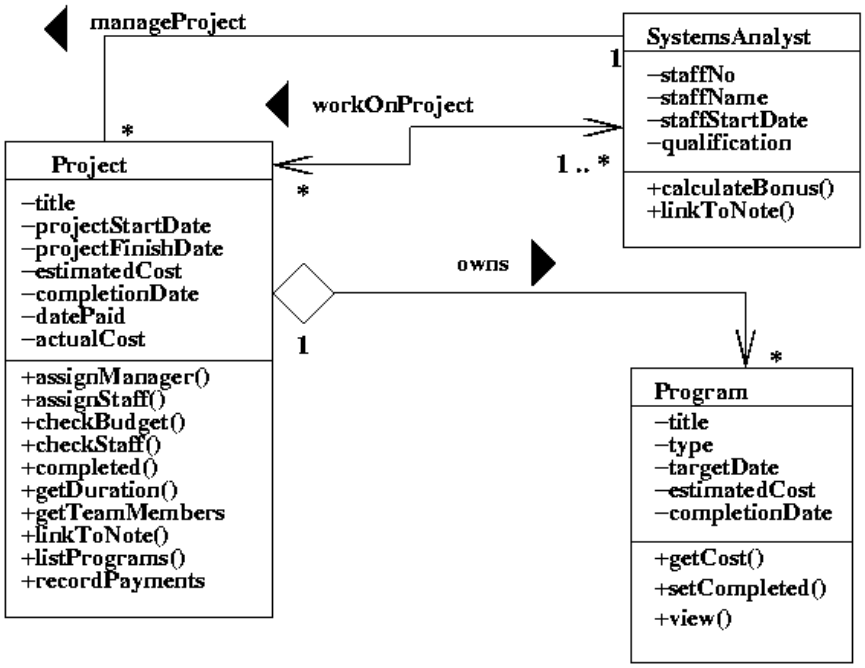

Figure 3

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

a) Given the class diagram fragment in figure 3, 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.

b) Discuss the two alternative mechanisms that one could use to trigger an update in the observer design pattern.

5 marks.

c) 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.

10 marks.

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

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

a) Write coding fragments to illustrate the implementation of the singleton design pattern
5 marks.

b) What problem is addressed by Gamma et al.'s State behavioural pattern? Illustrate this pattern through the use of a class diagram.
5 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.
10 marks.

Q5 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) 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 the discussion.
5 marks.

c) A dialog in an application GUI as depicted in Figure 5 overleaf has the following requirement: when the user clicks on the 'add' button, the contents of the text box are appended to the list 'List1'.
Identify a design pattern that supports this requirement,
and illustrate the discussion with a class and interaction diagram.
10 marks.

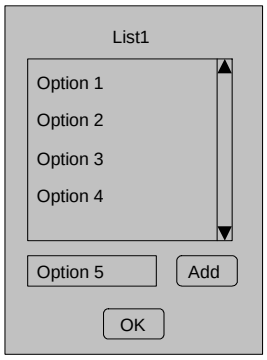

Figure 5

Q6 Answer ALL parts. Total marks awarded for this question: 20.

a) Briefly describe the algorithmic and non-algorithmic approaches used to specify an operation.

5 marks.

b) What is a use case class diagram?
Discuss the role of noun identification technique in drawing this diagram.

5 marks.

c) Describe the intent of the Model View Controller architectural pattern, and illustrate your answer through the use of a class diagram to illustrate structure, and a sequence diagram to model general runtime behaviour.

10 marks.