Closed book On Line examination
This exam will be taken on-line and this paper format will only be available as a back-up.

One and a half hours

UNIVERSITY OF MANCHESTER
SCHOOL OF COMPUTER SCIENCE

Software Engineering

Date: Wednesday 27th January 2010
Time: 14.00 – 15.30

Answer all multiple choice questions in Section A
(Only in the event that the exam is NOT taken on-line, please answer the reserve Question A1 at the back of the exam paper instead of the MCQs in Section A.)

and ONE question from Section B

The use of electronic calculators is NOT permitted.
The multiple choice questions for Section A are online.

Section A consists of 40 multiple choice questions, each worth half a mark giving a total of 20 marks. Questions B1 and B2 are worth 20 marks each. You should therefore expect to spend approximately half your time on Section A and half on Section B.

In the unlikely event that it is not possible to take the exam on-line, you should do the reserve question A1 at the back of this exam paper. Otherwise you should ignore this question.
A customer can use the Acme on-line photo shop to create many types of product using electronic images such as those taken with digital cameras or from scanned "old fashioned" photos. These products include wall calendars; desk calendars; photo books and such like. The customer can choose a type of photo based product and then is taken through a series of steps to create that product, uploading photos as necessary as the product is designed.

The customer can modify the look and feel of the product with borders, patterns and other typical photo-editing techniques such as scaling and colour adjustment. As photos are uploaded, they are stored in a database for later re-use. The product itself can be stored in the system's own database; it can also be downloaded in electronic form to the customer's own computer, where it can be viewed, but not altered and uploaded again. Previously created photo-products can be retrieved and possibly modified to be re-manufactured.

Once created and completed, the customer fills out an order form requesting number of copies; a postal address; etc. A bill is calculated and the customer pays on-line and the system uses a credit card payment validation system. Once the order is finished the customer's photo product is sent directly to a photo processing system where the product is manufactured. A human operative then picks up the printed calendars etc. and has it posted to the customer by a traditional postal service. The system then sends out an email saying the order has been sent.
B2.  

a) Explain why the set of classes on a **design class diagram** is not usually the same as the **domain class diagram** from which it was derived. (3 marks)

b) For each of the following, state whether it is appropriate to show it on a domain class diagram and briefly explain why.

   i) Types of attributes (2 marks)
   ii) Multiplicities on associations (2 marks)
   iii) Operations (2 marks)

c) The Irwell Media Store started off as a bookstore, but later started selling CDs and DVDs too. More recently it has started selling laptops too, and it plans to branch out into other electronic devices such as phones and PDAs, although it does not intend to become a general store. The company is taking its first tentative steps into the online marketplace, and has commissioned you to produce a prototype inventory system.

   Draw a domain class diagram which represents the kinds of products which the store currently sells, in a way which can be easily extended in the future. Hint: the best solution has 7 classes of which 3 are abstract. (5 marks)

d) If you were modelling a general store with thousands of different kinds of products, how would the domain model have to be different? (2 marks)

e) An inventory consists of a list of line items, each of which represents a particular product, the number in stock, and the price per item. Suppose this is implemented as follows:

   ```java
   public class LineItem {
   private Product theProduct;
   private Money UnitPrice;
   private int numberInStock;
   
   ... etc.
   }
   ```

   and the Money class has methods to add two amounts of money or to multiply an amount by an int:

   ```java
   public Money add(Money other)
   
   public Money multiply(int timesBy)
   ```

   i) Write a method for the LineItem class to calculate the total value of a line item. (1 mark)

   ii) Show how you would write a method in the Inventory class to get the total value of the products in the inventory assuming that the list of line items is stored as an instance variable called items, and the Monday class has a public constant `NO_MONEY` which is £0.0. (3 marks)
Reserve Question A1: Only do this question in place of Section A in the event that the exam is taken on paper.

a) In what way is Software Engineering significantly different from Civil Engineering (constructing buildings, bridges etc)? (2 marks)

b) “This software has bugs in, we just don’t know what they are yet”

Give one example for which this is almost certainly true, and one for which it is probably not true. (2 marks)

c) What is the goal of a formal/rigorous software development process? (2 marks)

d) Briefly state two problems which often arise in the Waterfall development process, and their underlying cause. (2 marks)

e) What is the main role of a glossary in a software project? Briefly state one other advantage of having a glossary. (2 marks)

f) A computer based public information booth is used by passers-by to find information about local events etc. Data are entered by a team at the local council and the system maintained by the company that developed the system. This company also provides someone that services the computer within the information booth.

What are the actors in this system? (2 marks)

g) After drawing a domain class diagram, what existing documents will probably need to be updated? (2 marks)

h) What, in software development, is a Pure Fabrication? Give an example which has not been used in the course. (2 marks)

i) What is the primary guideline which determines whether it's appropriate to use inheritance? Give an example which has not been used in the course. (2 marks)

j) A system to provide on-line booking of inclusive tours involves the user choosing a destination; a starting airport; a hotel; a time; a duration; and any number of day tours available during the time period. The user may need to change previous decisions, e.g. to choose a different set of dates if the rooms they want are not available.

What would be the best user interaction style for this application? Briefly explain why. (2 marks)

END OF EXAMINATION