Assignment 0 2017

ENGI 9874 Software Specification and Design
Electrical and Computer Engineering
Memorial University

Due Wednesday Sept 27 at start of class.

General instructions: Hand this in on paper, in class. I strongly recommend using Visual Paradigm for each diagram.

This is an individual assignment. Complete the assignment by your self, alone.

Q0 [10]. Domain analysis. Create a class diagram based on the following information:

Each credit card has a unique credit card number and a credit limit, and is associated with one customer, who has a single billing address. Each card is one of three kinds Gold, Platinum, or Plain. Interest rates depend on the kind of card; as of today the rates are

Kind	Rate per annum
Gold	6%
Platinum	8%
Plain	18%

but change each month. Each card is associated with any number of transactions. Transactions all have a posted amount, which is in Canadian dollars and cents, and a date. Types of transactions include: 'purchase transactions', 'cash advance transactions', 'payment transactions', 'interest transactions'. 'Purchase transactions', are associated with a vendor who has a 'vendor number' and a billing address.

Q1 [15]. Software Design. Mathematically, a finite directed graph is a structure $(V, E, \mathrm{src}, \mathrm{targ})$ where V and E are finite sets and s and t are total functions, $\mathrm{src}, \mathrm{targ} : E \to V$.

(a) Draw a UML class diagram representing a mutable directed graph. Start with classes for the graph, for nodes of the graph, and for the edges of the graph. Show associations with navigability, multiplicity, and, if needed, annotations indicating bags, ordered sets, and sequences. You should assume that each node object and each edge object is in at most one graph.

(b) Elaborate your class diagram by adding attributes and operations as needed. It should be possible to create new nodes and edges and to add these

to the graph, to remove nodes and edges from the graph, to obtain a list of all nodes in the graph, and to obtain a list of all edges in the graph. From each edge it should be possible to obtain, but not change, the source and target nodes.

(c) Show with a sequence diagram how a client can create a graph with at least 2 nodes and two edges.

Q2 [20] Widgets

(a) Create a class diagram for the following set of classes. Include all operations.

- A widget represents some sort of visual component, such as buttons, text boxes, images, or panels.

- Panel widgets may contain other widgets (even other panels) as children. There are in fact two kinds of panel widgets.

- Vertical panel widgets stack their children vertically, while horizontal panels stack their children horizontally.

- Each widget can be queried as to its width, height, x position, y position, preferred width, and preferred height.

A 'layOut' message sent to a widget causes it to set the size and position of each of its children (if any) based on their preferred width and height. The widget then sends a layOut message to each of its children.

A 'paint' message sent to a widget causes it to draw itself to the screen and then to send 'paint' messages to its children.

(b) Make an object diagram (see Fowler's book for more on object diagrams) showing a panel containing at least two widget.

(c) Based on your object diagram, make a sequence diagram showing what happens when a 'lay out' message and then a 'paint' message are sent to the top-level panel of your object diagram.