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

a) What are the characteristics of good software? 4 marks.

b) Briefly describe 4 benefits that arise from an "upfront commitment to design" i.e. the creation of abstractions/models prior to coding. 4 marks.

c) Describe 3 criticisms of the Unified Modelling Language (UML).

4 marks.

d) What are the problems that can arise in an implementation that lacks polymorphism? Illustrate the discussion with coding fragments or pseudocode that lacks polymorphism. 4 marks.

e) State the Liskov Substitution principle (LSP), and illustrate its application with a diagram. 4 marks.

f) Draw a diagram to illustrate the principle of "programming to interfaces, not implementation". What are the benefits that arise from use of this principle? 4 marks.

g) Briefly describe 3 criticisms offered with respect to use cases. 4 marks.

Agate is a public relations company that manages campaigns for clients. Its record system is a manual one, in much need of an urgent overhaul. A record is kept of each client company, and each client company has appointed one person who is the main contact person within that company. His or her name and contact details are kept in the client record in the Agate system. Agate nominates a member of staff – a director, account manager, or member of the creative team – to be the contact for each client.

Clients have advertising campaigns, and a record is kept of every campaign. One member of Agate’s staff, either a director or account manager, manages each campaign. Other staff may work on a campaign such as creative staff. Agate operates a project-based management structure, which means that staff may be working on many campaigns at the same time. For each campaign they work on, they are answerable to the manager of that campaign.

When a campaign starts, the manager responsible estimates the likely cost of a project and agrees it with a client. A finish date may be set for the campaign. When the campaign is completed, an actual completion date and the actual cost are recorded. When the client pays, the date is recorded. Each campaign includes one or more adverts that may be reused across different campaigns.

Each staff member is on a grade that determines his or her rate of salary. Agate’s accountant is responsible for:  Recording the addition of a new staff member  Adding a new staff grade,  Changing the rate of a staff grade  Changing the grade for a member of staff  Recording a client’s payment.

Agate have made a strategic decision to automate their manual system, and contract you for the requirements engineering, analysis and design phases of the project. After business modelling and requirements capture, you have specified the functional requirements as shown in Table 1. a) Draw a use case diagram which models the requirements. 4 marks.

b) Draw an analysis class diagram based on the use case model. List any further constraints that you which to include. The class diagram should include attributes, operations, associations, multiplicities, and other any model artefacts that you deem necessary. 10 marks.