

OLLSCOIL NA hÉIREANN, GAILLIMH
THE NATIONAL UNIVERSITY OF IRELAND, GALWAY

SPRING EXAMINATIONS 1999/2000

Third Examination in B.Sc. in Information Technology

CT321: SOFTWARE ENGINEERING II

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Time allowed: THREE hours

Answer **Question 1** and any **three** other questions of your choice
 All questions carry equal marks

- Q. 1.** The following text describes BIT Advertising Agency's business activities. You have been asked to work with the company to provide effective computer support for these activities.

BIT Advertising Agency (BIT-AA) deals with other companies it calls clients. A record is kept of each client company, and each client company has one person who is the main contact person within that company. His or her contact details are kept in the client record. Similarly BIT-AA nominates a member of staff – Director, Account Manager or a 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 BIT-AA's staff – either a Director or Account Manager – manages each campaign. Other staff also work on the campaigns on a project-basis – i.e. staff may be working on more than one project at a time. For each project they work on, they are answerable to the manager who may or may not be their own line manager.

When a campaign starts, the manager responsible estimates the likely cost of the campaign, and agrees it with the client. A finish date may be set at any time, and may be changed. When the campaign is completed, an actual completion date and the actual cost are recorded. When the client pays, the date paid is recorded. Each campaign includes one or more adverts. Adverts can be one of several types: newspaper, magazine, TV, radio, poster, leaflet. Each of these adverts may include written copy, graphics, photographs, video, actors, voice-overs, music etc.

Purchasing assistants are responsible for buying space in newspapers and magazines, TV or radio air-time. The actual cost of a campaign is calculated from a range of information: cost of staff-time, cost of studio time and actors,

cost of copyright material, cost of space in newspapers, air-time etc, and BIT-AA's margin on services and products bought-in.

This information is currently held in a paper-based filing system. A new PC in the office holds the salary grades and pay rates for the staff, so that the cost of staff time on projects can be calculated from the timesheets they fill out.

- (a) Identify all classes in the above description. Prepare a data dictionary entry for each class (name, description, scope, and any restrictions on its membership or use).

[5]

- (b) Prepare a class diagram from the above text, showing all associations (including any inheritance), attributes and operations

[20]

Q.2

Write a note on three of the following subjects. Illustrate your answer with reference to relevant examples as appropriate:

Design Patterns
Component Based Design
OODBMS
CRC cards
UML

[25]

Q.3

- (a) The overall organisation of software systems is often referred to as the *architecture* of the system. Explain what you understand by the term *Software Architecture* and the role played by this architecture in overall system design.

[7]

- (b) A system is described in UML using a number of different views. Describe the UML "4 + 1 View" architectural approach, using examples where appropriate to illustrate your description.

[10]

- (c) Explain the contribution of Watts Humphrey's *Personal Software Process* (PSP) to improving the overall software development process. Your answer should include references to the tools and techniques of the PSP, and may include references to any other relevant readings you have done on this subject.

[8]

Q.4

- (a) What types of Interaction diagram are used in UML? What are the differences in approach between each of the diagrams?

[4]

- (b) Draw an interaction diagram to support the BIT Advertising Agency, as described in Q.1 above, (you may need to identify one use case from the overall description). Give your reasons for choosing the interaction model you did.

[12]

- (c) During object oriented design, additional classes to handle the implementation-related activities of *Data Management*, *Human Interaction*, and *Task Management* are added to the initial class diagram. Identify the issues involved in designing components to support each of these implementation activities – i.e. the specific concerns they address, decisions or choices to be made etc. Use examples where appropriate to support your answer.

[9]

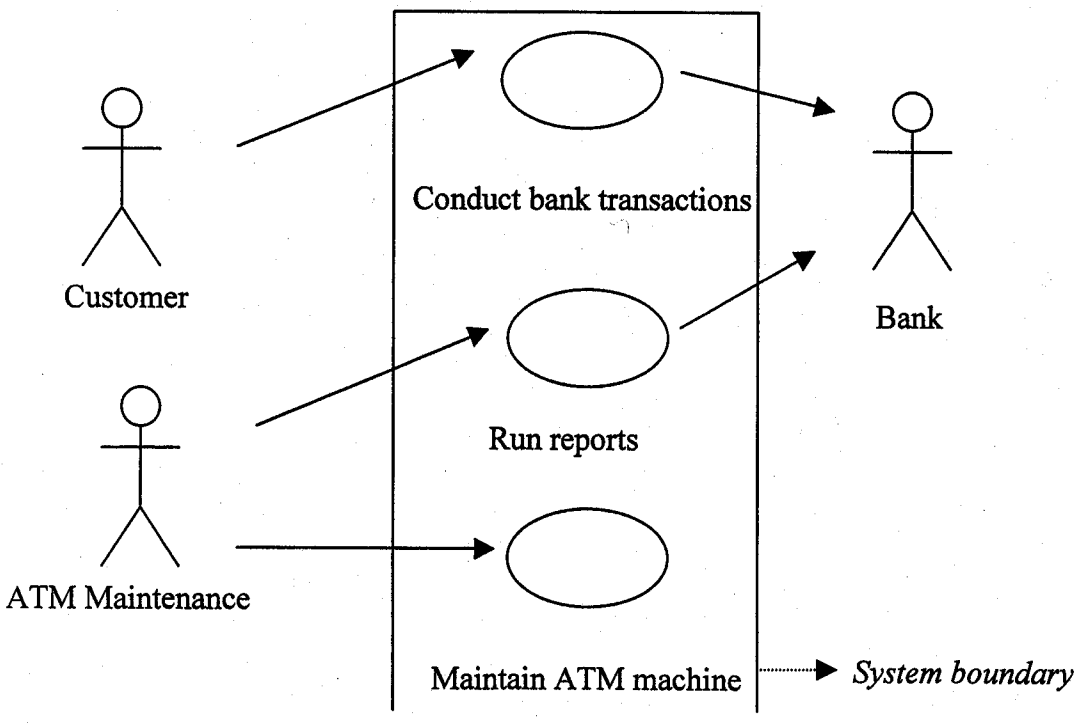
Q.5

- (a) What UML diagrams are used to support the modeling of system implementation? Identify and explain the purpose of each of these diagrams.

[5]

- (b) From the diagram below, produce a description and flow of events for the “Conduct Bank Transactions” use case. Devise two scenarios, one main and one alternate/exceptional, for this use case.

[10]



- (c) Testing is the one of the most important means available for assessing product quality. Describe the role of system testing in the overall object oriented systems development lifecycle, using UML as an example methodology.

[10]

Q.6

- (a) Reusability is one of the main reasons for the adoption of object oriented (OO) development techniques and programming languages. This reuse is most beneficial if it occurs at the component, as opposed to class, level. Discuss the role of standards and commercial componentware in supporting the development and use of reusable components in OO development projects. Use examples where appropriate to illustrate your answer.

[10]

- (b) The following is a scenario for a normal phone call:

caller lifts receiver
dial tone begins
caller dials digit (5); dial tone ends; caller dials digit (1); caller dials digit (5);
caller dials digit (1); caller dials digit (2); caller dials digit (3)
called phone begins ringing
ringing tone appears in calling phone
called party answers
called phone stops ringing
ringing tone disappears in call phone
phones are connected
called party hangs up
phones are disconnected
caller hangs up

Draw a state transition diagram for one phone line - not the caller or callee, based on the above scenario. The diagram should cover both normal as well as some abnormal sequences (e.g. timing out).

Hint: The event on-hook will cause a transition from any state to the Idle state

[15]