

OLLSCOIL NA hÉIREANN, GAILLIMH

National University of Ireland, Galway

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**DIPLOMA IN SYSTEMS ANALYSIS
(BUSINESS SYSTEMS DEVELOPMENT)**

**APPLIED SYSTEMS ANALYSIS
(MS 862)**

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Time allowed: **THREE** Hours

All questions carry **equal** marks

Answer **Questions 1 and 2** and any other **TWO** questions

Question 1

A library has a system that supports its operations. The following general features describe the system.

- • A library lends books and magazines to borrowers, who are registered in the system, as are books and magazines.
- • A librarian handles the purchase of new titles for the library. Popular titles are bought in multiple copies.
- • Old books and magazines are removed when they are out of date or in poor condition.

A borrower can reserve a book or magazine that is not currently available in the library, so that when it's returned or purchased by the library, that person is notified. The reservation is canceled when the borrower checks out the book or magazine, or where it is specifically cancelled. A title may be reserved more than once, by different borrowers.

The librarians are the direct users of the system. Borrowers are effectively the customers - those who check out and reserve books and magazines. The borrower is not intended to directly interact with the system. The librarian performs the following functions on the system.

- Lend Item
- Return Item
- Make Reservation
- Remove Reservation
- Add Title
- Update or Remove Title
- Add Item
- Remove Item
- Add Borrower
- Update or Remove Borrower

Staff refer to activities of adding items, adding titles, adding borrowers and so on as maintenance, whereas other activities performed (like lend item, return item, make and remove reservation) involve a borrower.

A title is the name of a given book or magazine issue, for which there may be several copies (thus several items). An item represents a physical copy of a specific title. The title has information such as the title name, author, year of publication, publisher and ISBN or magazine (ISSN) number. The item object can have the states "Loaned" or "Not loaned". The item always has a corresponding title object that defines it (i.e. the title, author and ISBN number).

The loan is the contract between the borrower and the library. When the item is returned, the loan object is destroyed. A borrower can be a person or another library. The principal information stored is name, address, city, zip code and state.

The following activities describe lending and returning books:

Lending

1. If the borrower has no reservation:
 - a. A title is identified.
 - b. An available item of the title is identified.
 - c. The borrower is identified.
 - d. The library lends the item.
 - e. A new loan is registered.
2. If the borrower has a reservation:
 - a. The borrower is identified.
 - b. The title is identified.
 - c. An available item of the title is identified
 - d. The library lends the corresponding item
 - e. A new loan is registered

- f. The reservation is removed.

Returning

- a. The borrower returns an item
- b. The title is identified
- c. The borrowed item of the title is identified
- d. The loan is identified through the title and item
- e. The corresponding loan is destroyed

Required:

Using the Unified Modeling Language as the basis for analysis of the narrative described above, do the following:

- • Draw a Use Case Diagram for the application.
- • Document one use case with text, describing the case and the series of activities that normally occur.
- • Draw Sequence Diagrams for the use cases "Lend Item" and "Return Item".
- • Draw a Class Diagram for all the objects, identifying the main attributes and operations.
- • State any assumptions that you make.

(25 Marks)

Question 2

- (a) (a) The New Island Kitchen Company has expanded its operations rapidly over the past ten years. They need a new database to support their activities. From the description of activities below construct an entity relationship diagram (ERD) and identify key attributes through brainstorming. Fully normalize your answer and state any assumptions that you make.

The Island Kitchen Company agrees a contract with clients to manufacture and install kitchens to the exact requirements of the client. Some contracts are with individuals and others with property developers. The company often has repeat business with property developers and therefore keeps a record of all their details so that they might be sent marketing literature through a mailing list. Property developers who have not done any business during the past 2 years are removed from the mailing list and those whose accounts have been deemed bad risks.

It is assumed that individuals will only need one kitchen. When a contract is agreed a 25% deposit is demanded and the balance is paid within 2 weeks of installation.

For a property developer they may have many kitchens. Sometimes a development will have identical kitchens in which case the specification is the same, at other times each may be different. Often, the company will liaise directly with the prospective homeowner to agree design differences and optional accessories. It is necessary in such situations to have contact details of the homeowner as well as the property developer.

For a particular kitchen installation the company wants an associated materials list to be created. This is currently produced by the kitchen designer's CAD package in a rich text format (RTF) - it can easily therefore be incorporated into the database. The materials list is to be checked against the inventory record of items like timber, MDF, laminated tops, handles, hinges and colours. The company wants the new system to be able to anticipate material shortages and produce prioritized lists of items to order from suppliers.

(20 Marks)

- (b) Using business examples, briefly explain Fourth and Fifth Normal Forms.

(5 Marks)

Question 3

- (a) The practice of systems analysis has shifted and changed considerably over the past three decades. Discuss these changes and how they have (or have not) contributed to greater productivity for IS staff and improved information systems for users.

(15 Marks)

- (b) How has systems theory contributed to systems development practice? Are all the core concepts of systems thinking relevant to modern system's development?

(10 Marks)

Question 4

- (a) (a) Describe the preparation, conduct and analysis of conventional interviews.

(12.5 Marks)

- (b) Group-based interviewing is an alternative to one to one interviewing. Discuss the conduct, advantages and drawbacks of group-based alternatives.

(12.5 Marks)

Question 5

The following activities describe the major tasks of a systems development project for a company:

| Activity | Precedence | Duration (weeks) |
|----------|------------|------------------|
| A | - | 5 |
| B | A | 18 |
| C | A | 6 |
| D | - | 7 |
| E | A,B,C | 9 |
| F | A,C,D | 10 |
| G | E,F | 4 |
| H | D,E,F | 3 |
| I | D | 11 |

Required:

- (a) (a) Draw a PERT/CPM chart suggested by the activities listed above, showing all activity relationships including dummy activities. Identify the critical activities and the critical path. (20 Marks)
- (b) From the PERT/CPM network drawn in (a) above, calculate float times for non-critical activities and explain how they may be used to highlight resource constraints. (5 Marks)

Question 6

- (a) Why is it that with C.A.S.E. technology as well as newer development approaches such as information engineering and object-oriented methods, things (in systems analysis) don't seem to be getting any easier. In your answer draw on your understanding of different aspects of systems development and practice. (15 Marks)
- (b) Documentation continues to be a serious if unattractive consideration for IS management and professionals. Why is this so and what in your view is a sensible position that an IS department should adopt in this regard. (10 Marks)

Question 7

(a) What are the most important issues and considerations for a company planning a major information systems development project?

(5 Marks)

(b) The IS Manager at Small Planet Limited has proposed two alternative groupwork support systems (A and B). System A anticipates significant changes in the installed system in the third year. Thus there will be two development phases. If System B is chosen all development costs are incurred at the beginning. Using estimated costs and benefits detailed below, advise the company on the relative merits of each alternative using Payback Analysis, Return on Investment, Net Present Value and your own judgement. (Express all costs and benefits in present value terms, assuming a discount factor of 3%).

| SYSTEM A | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|-------------------------|---------|---------|---------|---------|---------|---------|
| Costs: | | | | | | |
| Development Costs | 266,000 | 0 | 0 | 90,000 | 0 | 0 |
| Operation & Maintenance | 0 | 58,000 | 78,000 | 80,000 | 105,000 | 105,000 |
| Benefits | | | | | | |
| Operational Benefits | 0 | 195,000 | 185,000 | 100,000 | 210,000 | 230,000 |
| SYSTEM B | Year 0 | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| Costs: | | | | | | |
| Development Costs | 600,000 | 0 | 0 | 0 | 0 | 0 |
| Operation & Maintenance | 0 | 100,000 | 110,000 | 130,000 | 130,000 | 125,000 |
| Benefits | | | | | | |
| Operational Benefits | 0 | 150,000 | 400,000 | 400,000 | 380,000 | 280,000 |
| Discount Factors for 3% | 1.000 | 0.971 | 0.943 | 0.915 | 0.888 | 0.863 |

(20 Marks)