

INFORMATION SYSTEMS ANALYSIS AND DESIGN ADVANCED PROGRAMMING

(TWO AND A HALF HOURS ALLOWED)

You have ten minutes to read through this paper before the start of the examination.

Answer a total of FIVE questions.

*Select at least TWO from section A,
AND at least TWO from section B.*

Each question carries 20 marks.

SECTION A

1. Traditional methods of systems analysis and design have proved successful in many types of project. However, serious problems with traditional methods have led to the emergence of Structured Systems Analysis and Design Methodologies such as SSADM. While improving the quality of computer systems, SSADM has not provided a complete remedy for project problems.
 - a. Describe the types of computer project which have been successful under conventional methods of systems analysis. [4 Marks]
 - b. List and explain common problems in projects using conventional systems analysis and suggest reasons for the problems. [8 Marks]
 - c. Explain how SSADM helps to improve computer systems and discuss any limitations with the methodology. [8 Marks]

2. Structured Systems Analysis and Design Methodology (SSADM) has a hierarchical framework containing 5 modules, 7 stages, over 30 steps, and many tasks.
 - a. Draw a diagram to illustrate the hierarchical framework of SSADM. On the diagram, label the modules (or stages) of SSADM. [7 Marks]
 - b. With examples, explain the SSADM terms: *Step*, *Task* and *Product*. [7 Marks]
 - c. SSADM creates 'three views' of an information system. Explain briefly the purpose of each view, and suggest the main SSADM technique used to create each view. [6 Marks]

3. SSADM emphasises the importance of creating a detailed and rigorous Requirements Specification.
 - a. Describe briefly the SSADM products which are needed in order to start producing the Requirements Specification. [6 Marks]
 - b. Explain briefly the steps which are taken in developing:
 - (1) the processing requirements.
 - (2) the required data model. [8 Marks]
 - c. Summarise the components of an SSADM Requirements Specification. [6 Marks]

4. Data Flow Modelling is widely used in SSADM.
- a. Explain the purpose of Data Flow Modelling. [4 Marks]
 - b. Draw and explain the symbols used in Data Flow Diagrams. [5 Marks]
 - c. With the aid of a sketch, explain the different levels in data flow diagrams. [4 Marks]
 - d. Explain the differences between logical and physical data flow diagrams, and suggest how one is derived from the other. [4 Marks]
 - e. In which stages of SSADM are the different data flow models created? [3 Marks]
5. A library lends books free of charge to its members. Each member can have a maximum of five books on loan at a time. A loan is recorded against the book stock number, not the book title, because the library may have several copies of popular books. If a member wishes to borrow a book and all its copies are out on loan, the member may place a reservation against the required book title.
- a. List the entities in the library and explain your rules for identifying the entities in a system. [7 Marks]
 - b. Describe briefly a method for identifying all the relationships between entities. [3 Marks]
 - c. Construct an overview logical data structure (entity model) for the library. [6 Marks]
 - d. With examples from your entity model, explain the terms *Degree* and *Optionality* of relationships. [4 Marks]

SECTION B

6. Distinguish between FOUR of the following pairs of programming terms:
- a. Class and Object.
 - b. Compilation and Interpretation.
 - c. Definite and Indefinite Loop.
 - d. Inheritance and Encapsulation.
 - e. Machine Independence and Platform Independence. [20 Marks]
7. In either Java, 'C' or Pascal, write a complete program to perform the following tasks:
- a. To declare a boolean variable **sunny** and to assign its value 'false'.
 - b. To declare a floating-point numeric variable **temperature** and to assign 10.5 as its value.
 - c. To write conditional statements as follows:
 - (1) If **sunny** is true, display the message: "wear sunglasses".
 - (2) If **temperature** is less than 10, display: "wear a coat".
 - (3) If **sunny** is true and **temperature** exceeds 25, display: "go swimming today".
 - d. Describe the output of the program with **sunny** false and **temperature** 10.5 as in a. and b. above.
 - e. Discuss whether the logic of your program is complete and whether the program should be extended. [20 Marks]

8. The queue is an important data structure. Queues are sometimes implemented using a circular store, as in the case of entering characters from a keyboard.
- a. With the aid of a diagram, explain the meaning of a *queue*. [4 Marks]
 - b. Describe briefly how a queue may be implemented using a circular store. [4 Marks]
 - c. Using flowcharts, or otherwise, describe the procedure when:
 - (1) an item is added to the queue.
 - (2) an item is removed from the queue. [10 Marks]
 - d. Explain one method for distinguishing between an empty queue and a full queue when using a circular store. [2 Marks]
- 9.
- a. With the aid of a diagram, define the data structure known as a Tree, and distinguish between a binary tree and a general (multiway) tree. [8 Marks]
 - b. With the aid of a flowchart, or otherwise, describe the search process for a binary tree. [8 Marks]
 - c. Suggest TWO differences between the tree search and the binary search (binary chop). [4 Marks]
10. Sorting processes, whether internal or external, can be very time-consuming.
- a. Suggest TWO reasons for sorting records. [4 Marks]
 - b. Distinguish between an Internal Sort and an External Sort. [3 Marks]
 - c. Explain briefly why, if there is a choice, an internal sort would normally be preferable to an external sort. [2 Marks]
 - d. A data file having 256,000 records, and 128 Mbytes in volume, needs to be sorted on a single name field. Describe in detail a suitable sort process. [8 Marks]
 - e. Discuss whether the benefits of sorted data sets can be obtained without the need for a lengthy sorting process. [3 Marks]