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THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION Diploma

SOFTWARE DEVELOPMENT ENVIRONMENTS

27th April 2000 - 2:30p.m. - 4:30p.m.

Answer FOUR questions out of SIX. All questions carry equal marks.

Time: TWO hours.

*The marks given in brackets are **indicative** of the weight given to each part of the question.*

1.
 - a) Describe and distinguish between the requirements, specification and design stages of the software development life-cycle. For each stage, indicate a common error that could be made. **(8 marks)**
 - b) Where would you place the construction of a prototype in the software development life-cycle and how does it help with the early stages of software development? **(5 marks)**
 - c) Various diagrammatic notations can be used at the specification stage of the software development life-cycle. Describe **ONE** such notation and provide a simple example of its use. **(7 marks)**
 - d) A specification can be said to be informal or formal. What is meant by a formal specification? Give an example of a situation where a formal specification would be used or preferred over a less formal specification. **(5 marks)**
2. Apart from the facilities of the programming language itself, there are wider issues to be considered in choosing a high-level language for a project. These include the way the language is implemented (compiler/interpreter), the underlying operating system and the possibility of having to write in a platform-independent style.
 - a) "A beginner writes a whole program in a single file and runs it using an interpreter. A professional constructs a set of source files and uses a compiler." Referring to this quotation, explain the difference in scale of the programs involved and the different demands made on the language implementation system used. **(10 marks)**
 - b) Under one operating system a program is supplied with data by dragging a data file on to the icon representing the program. In another the name of the program is typed followed by the name of the data file.

Contrast the two approaches and describe scenarios where each is shown at its best. **(10 marks)**
 - c) What precautions should be taken when writing an application in a high-level language to ensure cross-platform compatibility? **(5 marks)**
3.
 - a) Describe in detail the operation of **TWO** different tools that can be used to assist the testing process. Your answer should indicate the advantages and any disadvantages associated with each approach. **(13 marks)**
 - b) Describe a method used to derive test cases. Illustrate how your selected technique would be applied to a routine that sorts integers held in a dynamic (linked) list. **(12 marks)**

4. When describing a programming language it is convenient to distinguish between program structures (also called control structures) and data structures. Data structures can be further broken down into internal data structures and external data structures. The three parts of the question below explore program structures and data structures and some of the relationships between them. You should choose an appropriate language or languages with which you are familiar on which to base your answers.
- a) One kind of program structure is called a *selection* structure. For a two-way choice this usually involves the keyword “if”. For a multi-way choice (more than 2) a separate structure can be used. Describe the syntax and operation of a specific multi-way selection structure. **(8 marks)**
 - b) For any one programming language:
 - i) List the built-in data types;
 - ii) Provide a code fragment which shows the declaration and use of a programmer defined type. **(10 marks)**
 - c) The data structures external to a program are files of various kinds. Give advice to assist a programmer in choosing whether to use a ‘text’ file or a ‘binary’ file for a particular situation. **(7 marks)**

5. a) Discuss **FIVE** typical compiler options that are commonly available when compiling a program. Indicate circumstances when each option would be used. **(8 marks)**
- b) Consider the following erroneous code fragment, which attempts to sum the numbers from 1 to 100 and forms part of a much larger program.

```
VAR
    Total : INTEGER
    Sum : INTEGER

Total = 9
FOR Sum = 1 TO 100 DO
    Total = Total + Sum
END
Print Total
```

Assuming the complete program contains no other references to the variable “Total”, and that the code correctly compiles and links, state the logical error which is the cause of the erroneous output. Explain how a debugging tool could be used to assist a programmer in finding the error. **(7 marks)**

- c) Discuss **FOUR** features typically found in a language specific editor. **(10 marks)**
6. a) A newly established software development company has two people in its development team and concentrates on the production of a single, evolving product. The two developers work largely in isolation on different sections of the software, writing in their own individual programming styles. When a new feature or change to the existing program is required, one of the programmers updates the code and simply copies the modified files to the other developer’s computer so that both programmers always have the complete and latest version. When orders are placed, the current versions of the files are copied directly from one of the developer’s computers. The only documentation is the code itself.

Discuss the main problems associated with this situation. **(12 marks)**

- b) The company is initially successful and hence employs a further two developers to enable additional features to be incorporated into the software. However, as the product increases in complexity and the size of the development team grows, it becomes apparent that a quality control strategy needs to be put in place.

Assume you have been employed as an external consultant. Write a report outlining a suitable strategy. Your report should highlight the benefits of implementing your proposal. **(13 marks)**