

THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION Professional Graduate Diploma

SYSTEMS DESIGN METHODS

4th May 2001- 10.00 a.m. – 1.00 p.m.

Answer THREE questions out of FIVE. All questions carry equal marks.

Time: THREE hours.

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

1.
 - a) There are a number of general software process models which all incorporate the four fundamental activities of software specification, development, validation and evolution. Explain the purpose of each of these four activities. **(4 marks)**
 - b) The waterfall model and the spiral model are two general software process models. With the aid of diagrams, provide a detailed explanation of each of these process models. For each process model clearly indicate how the specification, development, validation and evolution activities are incorporated. **(14 marks)**
 - c) A distinctive feature of the spiral model is its explicit consideration of risk. Explain what is meant by the term “risk” in this context and identify three risks associated with a real-world software development project with which you are familiar. Also indicate strategies that could be employed to reduce each identified risk. **(7 marks)**

2. In literature as well as in industrial practice, a distinction is normally made between the two design paradigms: real-time systems design and object-oriented systems design.
 - a) Referring to these two design paradigms, discuss the key notions (such as Tasks, Processes, and Objects) and their functions. Compare the ways in which concurrency is handled in these two design paradigms. **(12 marks)**
 - b) Suppose you are a consultant. Your client company intends to develop a temperature control system for multiple warehouses, and therefore needs to decide on a suitable method for the system design and implementation. Relating to your discussion in part a), give advice to the company and provide justification for your advice. **(13 marks)**

3.
 - a) Structured software development methods often include data flow diagrams (DFDs), state transition diagrams (STDs), and entity relationship diagrams (ERDs) to model different aspects of systems. For each of these three diagram types:
 - i) indicate what aspect(s) of a system the diagram type should be used to model
 - ii) illustrate the notation employed
 - iii) provide an example diagram fragment that relates to a system with which you are familiar, and include a short explanation of what the diagram fragment is modelling. **(15 marks)**
 - b) Consider a software development team that has been using structured methods in its system development activities, but until now has only ever used simple diagram editors and word processors to document its models. The team leader is considering introducing a simple workbench CASE tool which supports the particular method that they are using. Discuss, in detail, the benefits and possible problems that the introduction of such a tool would provide. **(10 marks)**

[Turn over

4. a) Software reuse can be achieved at different levels (analysis, design, coding) and from different perspectives (application system, component and function). Choosing one perspective, elaborate the notion of reuse at these different levels. **(12 marks)**
- b) In the context of software project planning, identify THREE reusable artefacts and describe the mechanism by which reuse of each artefact can be achieved. **(13 marks)**
5. a) Discuss the relationship between software engineering process and product quality, using diagrams for illustration. Based on your understanding or experience, you should include key activities in a typical process for quality checks of design documents. **(13 marks)**
- b) Assume that you are the manager of a software development team and would like to introduce the concept of software process metrics to your team. Write a short report that could be used to introduce the team to the concept of software process metrics. Your report should explain the different classes of process metric that can be collected and should indicate how you will decide what measurements to take and how to use the results. **(12 marks)**