UNIVERSITY OF WARWICK

Fourth Year Examinations: Summer 2003

Introduction to Empirical Modelling

Time allowed: 3 hours

Answer **Question 1** and **TWO** other questions.

Read carefully the instructions on the answer book and make sure that the particulars required are entered on each answer book.

Each question asks for a theoretical account of some aspect of Empirical Modelling (EM) followed by some illustration. When mark allocations for these two parts are given separately you are welcome to combine them into a single exposition.

Credit will be given for evidence of familiarity with a variety of standard EM models.

Compulsory question

1. (a) Briefly describe the essential principles of Empirical Modelling (EM) with reference to the roles that the experimental investigation of observables, dependency and agency, and LSD accounts, play in building interactive situation models (ISMs).   [20]

   (b) Illustrate your answer to (a) by describing typical examples of observables, dependencies and agents that might be considered in modelling a gas central heating system, and sketching appropriate ISM fragments that might be developed in such a context.   [20]

   [You should assume that the central heating system is controlled by a timing device in the form of a 24 hour dial with 4 markers on its circumference that can be used to switch the central heating on and off twice over this period, and that there is a switch for the heating that can be set to one of three modes: OFF, TIMED and ON. Refer, if you wish, to other devices (eg thermostats, a water pump or a pilot light) or activities (eg removing air locks from the system or adding a new radiator).]

2. (a) Describe the potential roles for several different kinds of human participant in the *development* of a product such as a model railway construction kit that enjoys the full support of modern computer-based technologies.   [10]

   (b) Discuss the extent to which EM activity could be organised to support the concurrent design of a product of this nature.   [10]

   (c) Illustrate your answer to (b) with reference to EM models relating to railway themes, to existing proposals for using EM to support the management of concurrent design, and your personal experience of the potential and limitations of current EM tools for distributed modelling.   [10]

Continued

3. (a) Explain the significance of the following ideas when using EM principles to construct software:

   (i) representing state-as-experienced rather than state-changing behaviours;

   (ii) development as an amethodical problem-solving activity;

   (iii) modelling as prior to the circumscription of behaviour. [15]

   (b) Illustrate the ideas (i), (ii) and (iii) respectively with reference to EM models of a simple program (such as the Jugs educational model), a reactive system (such as the dishwasher model), and an abstract algorithm (such as the Heapsort model). [15]

4. (a) Discuss an EM approach to educational technology in relation to other approaches with specific reference to the role of *interaction with artefacts* and *symbolic representations* in learning. Possible topics for inclusion are:

   - the Empiricist Perspective on Learning
   - theories of learning
   - critiques of the logicist approach to AI
   - William James's philosophic attitude of Radical Empiricism. [20]

   (b) Illustrate your answer with EM models where appropriate. [10]

5. (a) Briefly explain what is meant by the concept of *Human Computing*. [7]

   (b) Discuss the characteristics of EM principles and tools as an enabling technology for Human Computing. [8]

   (c) What do you consider to be the principal limitations of current EM tools where the agenda of Human Computing is concerned? [5]

   (d) Illustrate your answers to (a), (b) and (c) with reference to the support for human decision-making that is offered by EM models with which you are familiar. [10]

End