Computer Science Department

Dummy Cover Sheet

M.Sc. / Coll Dip

D03 Computer Management, 1997-98 and resit 1996-97.

2 hours 30 minutes

Answer THREE questions.

All questions carry equal credit. The use of electronic calculators is permitted.

Question 1

(a) Describe how you would characterise the performance of a computer system in terms of(i) its hardware, (ii) its software, and (iii) the service or facilities provided.

[10 marks]

(b) Describe how, in general, you would expect the value of the work done on a computer system to vary as a function of the system's utilisation. Explain the factors which cause the value of the work done to vary in this way, illustrating your answer by reference to (i) CPU usage, (ii) memory use, and (iii) file storage on disc. Discuss whether software usage is affected in the same way.

[13 marks]

(c) Describe how, if you were the manager of a computer system, you would use a curve such as you have described in (b) above to help explain to users and to institutional managers how the performance of your system could be improved and to illustrate critical factors in such performance tuning.

[10 marks]

[TURN OVER]

Question 2

(a) Discuss why software development projects are frequently out of specification, over budget, and/or late. Explain what, if anything, is peculiar to software development that might make it particularly difficult for such projects to be completed successfully, within budget and to time.

[10 marks]

- (b) Three software development projects for:
 - (i) a quantum chemistry simulation,
 - (ii) a patient record system for a local health practice, and
 - (iii) an automatic computer vision surveillance system, incorporating fixed cameras, pan and tilt camera units, and cameras mounted on mobile robots,

are all estimated to require approximately 100000 lines of code. One way of estimating the programming effort required for each project and how large a programming team should be used is to apply a mathematical model as in (c) below. Describe what other approaches you would use. Include in your description a discussion of how the projects differ and explain how you would try to make your estimates as reliable as possible.

[13 marks]

(c) Each of the projects described in (b) above has to be completed within two years. A competitor offers to develop them with teams of 5, 10 and 20 people respectively. You have a mathematical model based on the equations:

effort =
$$A(KDSI)^{\alpha}$$
 , (1)
development time = $B(effort)^{\beta}$, (2)

in which effort is measured in person-months, development time in months, KDSI stands for "thousands of delivered source instructions", and A, B, α, β are constants with, in your experience, values in the ranges: $1.25 \le A \le 2.0$, $1.0 \le \alpha \le 1.2$, $0.3 \le \beta \le 0.4$ and B = 3.0. Use this model to discuss to what extent you think your competitor's estimates are reasonable, and describe what factors may cause them to differ from your own estimates for each project. Comment on what these figures show about your competitor.

[10 marks]

[CONTINUED]

Question 3

A garden centre sells the products required to furnish and decorate a patio, garden or conservatory. Its business is expanding and the owners decide to install a new computer system to support all aspects of its administration and management.

(a) Discuss what the business goal(s) and objective(s) of such a garden centre might be.

[8 marks]

(b) Consider and assess the benefits that might contribute to the above objectives and might be realised from investment in such a computer system.

[10 marks]

(c) Calculate the payback period and the net present value (NPV) of the cash flows associated with this investment. Assume that:

- (i) The cost of the investment is $\pounds 40,000$.
- (ii) The cost of capital is 15%.
- (iii) The present value of £1 received at the end of:

Year $1 = \pounds 0.870$ Year $2 = \pounds 0.756$ Year $3 = \pounds 0.658$

(iv) Positive cash flows resulting from the investment are estimated as:

Year
$$1 = \pounds 6,000$$

Year $2 = \pounds 22,000$
Year $3 = \pounds 24,000$

(v) The computer system has zero value at the end of year 3.

[6 marks]

(d) The positive cash flows are estimated to result solely from staff savings arising from automation of tasks previously done manually. Advise the owners whether to proceed with this project.

[9 marks]

[TURN OVER]

Question 4

A local Health Centre contains four Doctors and various staff for medical and administrative support. The Doctors decide to review the strategy of the Centre. They believe they should offer a broader range of medical services and expect to upgrade their computer system to cope with expansion of their activities. Discuss:

(a) The different types of computer-based information systems that might be used in the Centre.

(b) The strategic information the Doctors might require before making any decisions.

[8 marks]

[8 marks]

(c) Who the customers are for this new computer system.

[8 marks]

(d) The critical factors or performance objectives that might be associated with strategic success from installation of the new computer system.

[9 marks]

Note that a detailed understanding of the workings of the UK National Health Service is not expected.

[End of paper]