THE UNIVERSITY
of LIVERPOOL

JANUARY 2005 EXAMINATIONS

Bachelor of Arts : Year 3
Bachelor of Engineering : Year 3
Bachelor of Science : Year 3
Master of Engineering: Year 4

SOFTWARE ENGINEERING II

TIME ALLOWED : Two Hours and a Half

INSTRUCTIONS TO CANDIDATES

SECTION A: ANSWER ALL QUESTIONS
(Section A is worth 50%)

SECTION B: ANSWER 2 OUT OF 4 QUESTIONS
(25 marks for each answer: Section B is worth 50%)

If you attempt to answer more than the required number of questions in Section B, the marks awarded for the excess questions will be discarded starting with the lowest mark.

Section A

Answer ALL questions in Section A. Section A is worth 50% of the marks available.

A1

Describe briefly the beast that Brooks' "silver bullets" are meant to kill.

(5 marks)

A2

How might the software engineering principle of *incremental organic growth* be used in developing a computer interaction interface? Using a programming language with which you are familiar sketch a simple program that demonstrates the principle.

(5 marks)

A3

NASA dropped its slogan "Faster, Cheaper, Better" referring to its software engineering standards in 1996. Explain why they might have done this.

(5 marks)

A4

A software engineering project originally estimated to require four people has been re-estimated to now need 6 people. What is the increased pair-wise communication effort required if it was originally estimated to be 24 hours per week? Explain fully the basis of your calculation.

(5 marks)

A5

Software engineering productivity metrics are usually based on size or measure of function. Describe fully one measure of size and one measure of function that are commonly used for this purpose.

(5 marks)

A6

You are led to believe that an object oriented software design pattern will provide a solution to a software engineering problem. Explain where this solution may be found and in what form it will be stored.

(5 marks)

A7

In the software engineering context what is meant by extreme programming or XP and what are the main principles of the approach? What is meant by the XP life cycle?

(5 marks)

A8

Explain how a CASE technology classification scheme may be helpful in determining what CASE tools are procured?

(5 marks)

A9

What fundamental issues in ubiquitous computing does the concept of "disconnected operation" as described in the CODA System research work address?

(5 marks)

A10

Explain two ways in which L-systems differ from standard ways of presenting formal language grammars. Which approach might be most appropriate to develop a new biological development language?

(5 marks)

Section B

Answer 2 questions in Section B. Section B is worth 50% of the marks available.

B1 A software engineering project is estimated to take 15 person months and to require a team of three people. Project mileposts are set for every month, and the project is monitored each month after evaluation of the milepost. The first month's milepost is not reached until month two, a slippage of one month. On investigation it is noted that the slippage is unlikely to recur. Make the following assumptions: a) that there is no change in the project specification, b) the project must be completed on the existing timescale, and c) that training appropriate staff new to the project takes two weeks each.

(a) What is the minimum number of extra staff required to deliver the project? Explain your reasoning and illustrate your answer with suitable diagrams.

(10 marks)

(b) How many extra staff would be required if the slippage was discovered to have been because of a uniformly low initial estimate of effort required? Illustrate your answer with suitable diagrams and comment briefly on what alternatives to increasing staffing level might be available to the project managers.

(15 marks)

B2

(a) The Linux operating system was developed (by Linus Torvalds) in an "unconventional" way according to Eric Raymond. Describe the main features of the approach and explain (in your opinion) what marks out the success or otherwise of the project.

(15 marks)

(b) Would a more conventional approach have been appropriate, and if not why not?

(10 marks)

B3

   (a) Contrast the "extreme programming" approach to software development with the classical "surgical team" approach.

                      (10 marks)

   (b) Comment on which approach would be more suitable for developing the software that is to be used in a new passenger aircraft.

                      (15 marks)

B4 A program that calculates the area and circumference of a circle is presented below:

```
program
    pi := 3.142;
    rad := 3;
    if DEBUG then rad := 4 fi;
    area := pi * (rad * rad);
    circ := 2 * pi * rad;
    output(area);
    output(circ);
end.
```

   (a) Sketch the program dependency graph for the program outlined above taking care to annotate all the elements in your sketch.

                      (10 marks)

   (b) What would appear in a backward slice from the end of the program with the criterion variable set as `"circ"`.

                      (7 marks)

   (c) Which program slicing method would be most appropriate if the program was to be extended to allow an endless loop taking input of the `rad` value, but making the same calculations as above.

                      (8 marks)