

PAPER CODE NO.
COMP 319



THE UNIVERSITY
of LIVERPOOL

JANUARY 2007 EXAMINATIONS

Bachelor of Arts : Year 3
Bachelor of Engineering : Year 3
Bachelor of Science : Year 3
Master of Engineering : Year 3
Master of Engineering : Year 4
No qualification aimed for : Year 1

COMP319 : 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 what is meant by the "Software Engineering Crisis" and outline the key solutions that have been proposed for it.

(5 marks)

A2

Using an imperative programming language, sketch a program that illustrates the software engineering principle of *incremental organic growth* in developing a computer interaction interface. Explain how your program permits *incremental organic growth* to occur.

(5 marks)

A3

The slogan "Faster, Cheaper, Better" referring to software engineering was adopted by NASA in 1996 but dropped two years later. Comment on why this decision might have been made.

(5 marks)

A4

Discuss the issues raised in ubiquitous computing by the concept of "disconnected operation" described in the CODA System research work?

(5 marks)

A5

Describe what is meant by *software productivity metric* based on size or measure of function. Explain fully one measure of size and one measure of function that are commonly used for this purpose.

(5 marks)

A6

You are a Computer Graphics lecturer that uses the same basic 30 lecture set of notes for both an Honours level and an MSc degree courses. (The MSc course omits the first 10 introductory lectures). Describe the most appropriate *object oriented design pattern* that you might use to generate the software that maintained the separate lecture note documents and outline the key feature of the design pattern approach.

(5 marks)

A7

In the software engineering context what is meant by the *agile method approach* to software development? Would such an approach be suitable for making significant changes to web portal software?

(5 marks)

A8

Explain how CASE technology classification might help in determining which CASE tools are procured by a software company?

(5 marks)

A9

In ubiquitous computing research, faults are a key concern. Describe why this might be the case and explain briefly how the problem is tackled.

(5 marks)

A10

Describe two ways in which L-systems differ from standard ways of presenting formal language grammars. Would an L-system approach be appropriate for developing a new biological development programming language?

(5 marks)

Section B

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

- B1 A software development project is estimated to take 15 months and to require a team of six people. Project milestones are set every three months, and the project is monitored after evaluation of the milestone. The first 3 month milestone is not reached until month six, a slippage of three months. 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 six weeks each.
- (a) What is the minimum number of extra staff required to deliver the project? Explain your reasoning and illustrate your answer with a suitable diagram. (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 required effort? 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 Lifelines program is considered among the best genealogical systems currently available and yet has been developed in what has been classified by Eric Raymond as an "unconventional" approach. Describe with examples the main features of the approach and suggest why it works. (8 marks)
- (b) Explain (in your opinion) what marks out the success or otherwise of its use in the Lifelines project. (7 marks)
- (c) Would a more conventional approach have been appropriate for the Lifelines development? (10 marks)

B3

- (a) Describe the key features of Mark Weiser's "third wave" of computer use. From your own experience outline the impact it might have. (5 marks)
- (b) In what sort of software engineering environment might products for the third wave be generated and delivered? (5 marks)
- (c) Associated with the third wave "delivery debate" according to Weiser are four myths. From your background research comment on whether these myths are real or not. (8 marks)
- (d) Discuss whether the nature of the third wave will radically change our assumptions concerning the software engineering environment. Comment on the research issues this might raise. (7 marks)

B4 A C main program and function that sums a series of integers is presented below:

```
1 void main() {
2     int i = 1;    int sum = 0;
3     while (i<11) {
4         sum = add(sum, i);
5         i = add(i, 1);
6     }
7     printf("sum = %d\n", sum);
8     printf("i = %d\n", i);
9 }
10
11 static int add(int a, int b)
12 {
13     return(a+b);
14 }
```

- (a) Sketch the intermodular 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 statement in line 8. (7 marks)
- (c) Which program slicing method would be most appropriate to investigate modification of line 3 to allow the constant 11 to be changed for the variable j , initialised in a new statement just before the while loop. (8 marks)