

**UNIVERSITY OF EAST ANGLIA**

School of Computing Sciences

UG Reassessment/Delayed First Sit Examination 2011-12

**PROBLEM SOLVING**

CMPS5C88

Time allowed: 4 hours

Answer TWO questions from Section A, ONE question from Section B, ALL questions from Section C and THE question from Section D.

Separate answer books should be used for each section.

**Notes are not permitted in this examination.**

**Do not turn over until you are told to do so by the Invigilator.**

## SECTION A

Answer TWO questions from this Section.

1. Present an architecture for a simple mainframe, explaining the purpose of the little lights on the front. [12 marks]

Illustrate your answer by describing in terms of fetch-execute cycles the execution of a small accounting package. [12 marks]

2. Write a "Hello World" program in Java. [24 marks]

3. A Boolean function  $F$  is given by

$$F = AvB$$

Give an expression for  $F$  in its simplest form. [2 marks]

Now spend half an hour wondering why this question is so much easier than all the others, and trying to work out what you have missed. [22 marks]

4. A self-starting two-up two-down JK flip-flop asynchronous decade ripple counter is required. Discuss. [24 marks]

5. Explain the operation of a NAND gate in each other following technologies:

TTL,DCTL,DTL,DTDCLT,McDLT,CMOS,NMOS,ECL,I2L,MC2

[8 marks]

- (a) Which one causes there to be slightly more electron-positron pairs in the valence band? [8 marks]

- (b) Given that you're meant to be doing a Computer Science and not a Physics degree, does it really matter? [8 marks]

## SECTION B

Answer ONE question from this Section.

6. Explain what is meant by a stream (or lazily evaluated list). [20 marks]

Show how streams can be used in ML with monotonous regularity to produce examination questions. [4 marks]

7. Show how higher order functions can be used in ML to model

(a) the natural numbers. [2 marks]

(b) the fission process inside a nuclear reactor. [12 marks]

(c) just about anything you care to mention. [10 marks]

## SECTION C

Answer ALL questions from this Section.

8. State the principal of mathematical induction. [5 marks]

Use induction on the question numbers on this paper to show that the fact that you can't do the first question means that you probably won't be able to do any of the others either. [19 marks]

9. Show that there is no known algorithm for answering exam questions. [12 marks]

Deduce that you are wasting your time trying. [12 marks]

10. This bit comes in two parts in the same paragraph: (a) first part, (b) second part. [11.5,12.5 marks]

## SECTION D

Answer THE question from this Section.

11. Answer this question.

(a) Analyse Figure 1 and draw a related image.

[12 marks]

X

Figure 1. Image for Question 11a

(b) Analyse Table 1 and write another table.

[12 marks]

This bit of the question has a bullet-point list:

- first item.
- second item

Table 1. Table for Question 11b

A	B
1	2

**END OF PAPER**