RMIT School of Computer Science and Information Technology

Final Examination December 2003
XM217 - Computing Fundamentals
Date: 9th December 2003 Duration 3 Hours plus reading time
Reading Time: 15 minutes prior to exam Number of pages: 6

Instructions to Candidates – PLEASE READ CAREFULLY:

- Answer ALL questions

- This is an "open book" exam. You may use any published textbooks, class notes, copies of assignment work, or any other printed or written material.

- Total marks for this paper are 180.
  As a guide one minute of your time is worth one mark.
  This paper accounts for 60% of your final marks in this subject.

- Read the questions carefully during reading time if you need to clarify any thing you do not understand during this time your tutor will be available online. If you need to make any assumptions then state them in your answer.

- Your answers to these questions need to be typed up for electronic submission via email at the end of the exam period. Acceptable formats include: plain text (.txt), HTML (.html or .htm), or rich text format (.rtf).
  Exams submitted in MS Word format will NOT be accepted

- When you are satisfied you have completed the exam to the best of your ability or your 3 hours have expired, please email your solutions to geoffw@cs.rmit.edu.au

- I recommend you email two copies of your solutions, one each in separate emails.

- Very best of luck.
**Question 1** (15 Marks)
Describe each of the following errors, how do they occur? Give an example an each.

(i) Logical errors

(ii) Syntax errors

(iii) Runtime errors
Question 2  (45 Marks)

(i) A program is loaded into a computer's memory at location \(4FF_{16}\) and occupies memory to \(9FE_{16}\). Show full workings to calculate the size of the program.

10 marks

(ii) Integers on a computer are coded in 16 bit binary, can the number -32769 be represented in two’s complement? Why/why not?

10 marks

(iii) Briefly describe the shortcoming of one’s complement binary notation. How does two’s complement binary notation overcome this shortcoming?

10 marks

(iv) Calculate the following calculation in two’s complement binary:

\[488 - 411\]

15 marks
**Question 3**  (20 marks)

Using Truth tables determine which of the following expressions are Equivalent to  
(NOT Y) OR (X AND Y)

1. NOT (X OR Y)  
2. X OR (NOT Y)  
3. Y AND (X XOR Y)  
4. (X OR Y) AND Y
**Question 4  (40 marks)**

Write a solution in pseudocode that reads in two positive integer values and then prints a multiplication table based on the two numbers. The first number represents the multiplier and the second number is the largest multiplicand to be used in generating the table. For example if the numbers were 6 followed by 8
Your solution must print

6 x 1 = 6
6 x 2 = 12
6 x 3 = 18
6 x 4 = 24
6 x 5 = 30
6 x 6 = 36
6 x 7 = 42
6 x 8 = 48

declare all variables used in your solution
Question 5  ( 20 + 20 + 20 = 60 Marks )

Given that we can use modulus % to determine the remainder after two numbers are divided, eg.

```c
printf("the remainder of 6 / 2 = %d\n", 6 % 2);
```

will print   the remainder of 6 / 2 = 0

```c
printf("the remainder of 9 / 5 = %d\n", 9 % 5);
```

will print   the remainder of 9 / 5 = 4

Implement a function that receives an integer and returns the lowest number that that integer is divisible by. Only numbers that are divisible by another number (not 1) should be printed

(a) Present your solution to the above problem in pseudocode             20 marks
(b) From your pseudocode, develop a C code implementation            20 marks
(c) Using the function you developed in part b write a main function that uses your function to test all numbers between 2 and 100        20 marks

Eg.

4 is divisible by 2
6 is divisible by 2
8 is divisible by 2
12 is divisible by 2
14 is divisible by 2
15 is divisible by 3
16 is divisible by 2
18 is divisible by 2
20 is divisible by 2
21 is divisible by 3
22 is divisible by 2
24 is divisible by 2
etc. etc.