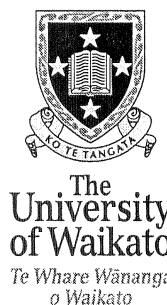


Student Name: _____

School: _____

2007 SCHOLARSHIP EXAMINATION

WRITTEN SECTION



DEPARTMENT	Computer Science
COURSE TITLE	Computer Science Scholarship
TIME ALLOWED	Two Hours
NUMBER OF QUESTIONS IN PAPER	Twelve
NUMBER OF QUESTIONS TO BE ANSWERED	Twelve
VALUE OF EACH QUESTION	The value of each question is indicated.
GENERAL INSTRUCTIONS	Candidates are to answer ALL questions in the answer booklet provided
SPECIAL INSTRUCTIONS	None
CALCULATORS PERMITTED	Yes

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Section A: Computing Concepts

1. Convert the binary value 110110110 to
(a) Octal (base 8) (b) Hexadecimal (base 16) (c) Decimal (base 10)
(5 marks)

2. Add the two eight bit binary numbers 00110011 and 00101101. Please show your working, including carry bits.
(5 marks)

3. The value 2,004,310,016 was stored in a 32 bit integer (int) variable. When it was multiplied by 16 the result was 2,004,189,184, and when that was multiplied by 17 the result was the negative value -288,522,240. Explain why this happened.
(5 marks)

4. Real numbers (called floats in many programming languages) store values in a form of scientific notation.
 - (a) Why is scientific notation useful in programming?
 - (b) Arithmetic operations with real numbers do not always give the precise results that we might expect. Discuss.(5 marks)

5. A new computer has 2GB of main memory and a 120GB hard disk. 'Main memory' can store information, and so can the hard disk.
 - (a) In what way do these two forms of information storage differ and why does a computer usually need both?
 - (b) If a computer salesperson were asked by someone with little computer knowledge, how much useful information could be stored in 2GB, how could they answer the question in a way that would be helpful?(5 marks)

6. When I was buying a new computer to use for game playing recently, the salesperson told me that it was more important to invest in a good graphics card, than it was to have a particularly fast processor. Was this good advice? What functions does a graphics card perform on a modern computer system?
(5 marks)

7. An administrator is designing the network for a multiplayer computer game. One computer in the network will be the server and there will be a number of client machines on which people will participate in the game. The game logic runs on the server. On each graphics frame (at 60 frames per second), the server must tell each client computer the positions and orientations of about 70 objects (players, weapons, bullets, etc). Describing the position and orientation of an object requires 28 bytes (7 real numbers). If the network works at 10Mbits per second, how many client machines can it support? Explain.
(5 marks)

10. Write a program fragment to display a striped square with M rows and M characters wide, where the stripes are separated horizontally by three spaces. When M is 20, your square should look like this:

```
*****
**   *   *   *   *
*  *   *   *   *   *
*   *   *   *   *   *
**   *   *   *   *   *
*  *   *   *   *   *
*   *   *   *   *   *
**   *   *   *   *   *
*  *   *   *   *   *
*   *   *   *   *   *
**   *   *   *   *   *
*  *   *   *   *   *
*   *   *   *   *   *
**   *   *   *   *   *
*  *   *   *   *   *
*   *   *   *   *   *
**   *   *   *   *   *
*  *   *   *   *   *
*****
```

(7 marks)

11. An array V holds N numbers, where N is in the range 10 to 1000.

- (a) Write a code fragment to calculate the sum of the numbers (ie: add them all up).

(5 marks)

- (b) Write a code fragment to determine how many of the numbers in the array lie between 100 and 200 (inclusive).

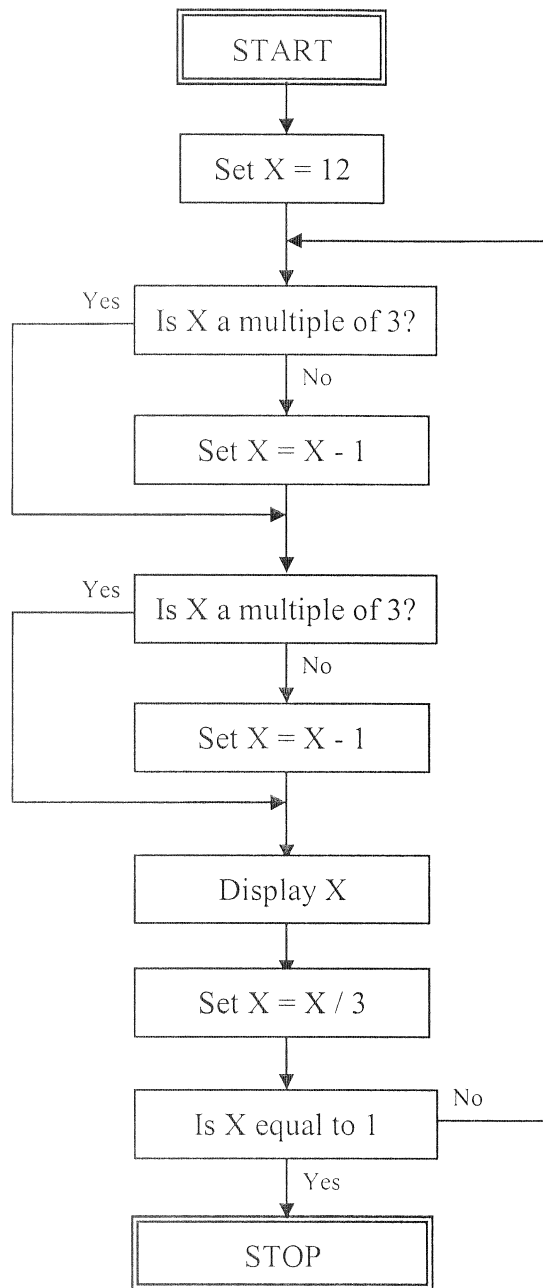
(5 marks)

- (c) Write a code fragment to reverse the order of the numbers in the array.
ie: If the array contained the 5 numbers (N=5): 44, 55, 22, 11, 10 then after running your fragment the array should hold 10, 11, 22, 55, 44 in that order.

(8 marks)

Section C: Problem Solving

12. Consider the algorithm described by this flow chart.



- (a) Write down the values that are displayed by this algorithm. (5 marks)
- (b) What will happen if the algorithm starts with X set to 14 instead of 12 (in the second to top box). (5 marks)
- (c) What would happen with other starting values for X? You should analyse the algorithm and explain what will happen for all starting values of X in the range 0 to 30. (20 marks)