

**THE AUSTRALIAN NATIONAL UNIVERSITY**  
**COMP1200 - Perspectives on Computing**  
**Mid-semester Exam - Semester 1 - 2008**

Writing Period : 60 minutes duration  
Study Period : 0 minutes duration  
Permitted Materials : None  
Maximum Marks : 40  
Answer : ALL questions

Family Name :

Given Names :

Student Number :

Answer all questions in the space provided in either black or blue pen.

This exam is worth 20% of the exam mark.

If there is insufficient space for you to answer a question, then use the blank pages at the end of this exam paper and clearly indicate this in the space provided for the answer.

No copy of this paper is to be removed from the examination room by candidates nor may any portion of the paper be copied - all copies must be returned to the examiner.

*For use by the examiners*

Q1	Q2	Q3	Q4	Q5	Q6	Q7	
Q8	Q9	Q10	Q11	Q12	Q13	Q14	Total/40

1. [3 marks] Fill in the blanks in the following sentences.

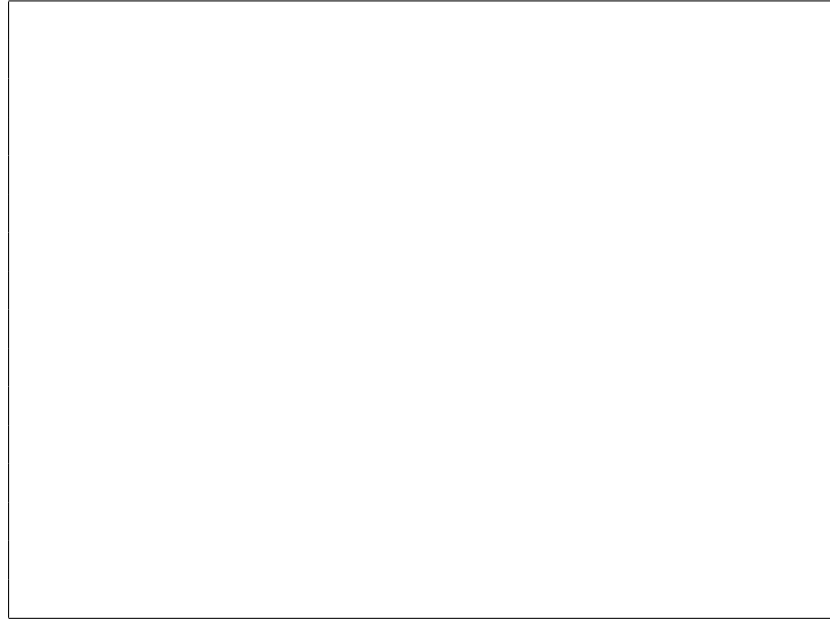
- The unsigned, 3-digit, hexadecimal number 19D represents  
the unsigned, 12-bit, binary number \_\_\_\_\_  
the unsigned decimal number \_\_\_\_\_
  
- The unsigned decimal number 503 represents  
the unsigned, 12-bit, binary number \_\_\_\_\_  
the unsigned, 3-digit, hexadecimal number \_\_\_\_\_
  
- The the unsigned, 12-bit, binary number 001010001011 represents  
the unsigned decimal number \_\_\_\_\_  
the unsigned, 3-digit, hexadecimal number \_\_\_\_\_

2. [3 marks] Fill in the blanks in the following sentences.

- (a) (i) The largest decimal value that can be stored in excess 4 notation is \_\_\_\_\_
- (ii) The smallest decimal value that can be stored in excess 4 notation is \_\_\_\_\_
- (b) (i) The largest decimal value that can be stored in excess  $n$  notation (where  $n$  is a power of 2) is \_\_\_\_\_
- (ii) The smallest decimal value that can be stored in excess  $n$  notation (where  $n$  is a power of 2) is \_\_\_\_\_

3. (a) [2 marks] Draw the circuit diagram for the logical expression

$$((\neg A) \vee (\neg B)) \wedge C.$$



- (b) [3 marks] Complete the truth table for the logical expression in part (a).

A	B	C	ANSWER
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

4. [2 marks] Fill in the blanks in the following sentence.

- The three actions of the machine cycle are:

Fetch, \_\_\_\_\_ and \_\_\_\_\_.

5. [3 marks] Fill in the blanks in the following sentence.

- In Big-Oh notation, the worst-case performance of the *binary search* algorithm, for an input of size  $n$ , is \_\_\_\_\_.
- In Big-Oh notation, the worst-performance of the *sequential search* algorithm, for an input of size  $n$ , is \_\_\_\_\_.
- Given the following facts:
  - Searching a sorted list of items for a particular item is  $\Omega(\log n)$
  - We can find an algorithm that searches a sorted list for a particular item with worst-case running time of  $O(\log n)$

We can conclude that searching a sorted list of items for a particular item is  $\Theta(\log n)$ .

Write TRUE or FALSE: \_\_\_\_\_.

6. [4 marks] One of the software components found in the kernel of an operating system is the *device manager*, another four software components are:

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

7. [3 marks] True or false:

- The function  $n^2 \log n$  is bounded by the function  $n^3$ .

Write TRUE or FALSE: \_\_\_\_\_

- The function  $2^n$  is bounded by the function  $n^2$ .

Write TRUE or FALSE: \_\_\_\_\_

- The function  $n$  is bounded by the function 1.

Write TRUE or FALSE: \_\_\_\_\_

8. [2 marks] True or false:

- The *halting problem* is in the complexity class  $\mathcal{NP}$ .

Write TRUE or FALSE: \_\_\_\_\_

- The *travelling salesperson problem* is *tractable*.

Write TRUE or FALSE: \_\_\_\_\_

9. [2 marks] True or false:

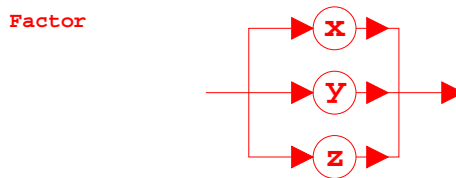
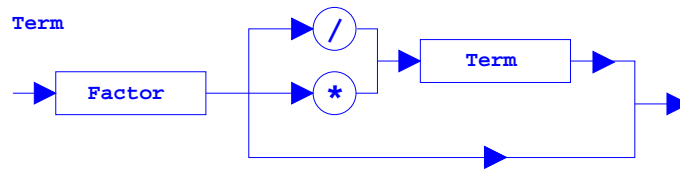
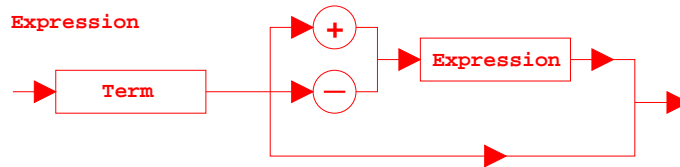
- The *declarative language programming paradigm* applies general-purpose, pre-established problem solving algorithms to solve a problem.

Write TRUE or FALSE: \_\_\_\_\_

- In the *object-oriented language programming paradigm*, objects are able to request actions of other objects.

Write TRUE or FALSE: \_\_\_\_\_

10. [3 marks] The syntax diagrams representing a simple algebraic expression are as follows:



Draw the parse tree for the expression  $x * y * z$

11. [2 marks] Write down whether each of the following statements is true or false.

In the layered approach to the design of complex systems:

- The high level language layer is below the machine language layer.

Write TRUE or FALSE: \_\_\_\_\_

- The operating system layer is above the high level language layer.

Write TRUE or FALSE: \_\_\_\_\_

12. [4 marks]

- The decimal number 17 is represented in signed, 8-bit, two's-complement, binary as \_\_\_\_\_

- The decimal number -126 is represented in signed, 8-bit, two's-complement, binary as \_\_\_\_\_

- The signed, 8-bit, two's-complement, binary number 00110010 represents the decimal number \_\_\_\_\_

- The signed, 8-bit, two's-complement, binary number 11001110 represents the decimal number \_\_\_\_\_

13. [2 marks] In the field of network design, the difference between a *switch* and a *router* is

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14. [2 marks] Using Big-Oh notation, give the worst-case time complexity,  $T(n)$ , of the following piece of code:

```
 $i \leftarrow n$ ;  
while ( $i > 0$ )  
do {  
     $j \leftarrow 1$ ;  
    while ( $j < n$ )  
    do {  
         $k \leftarrow n$ ;  
        while ( $k > 0$ )  
        do {  
             $k \leftarrow k/2$ ;  
        }  
         $j \leftarrow j + 1$ ;  
    }  
     $i \leftarrow i - 1$ ;  
}
```

$T(n) =$  \_\_\_\_\_

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