Brock University
Instructor: Brian Ross

NAME (print): _____

STUDENT NUMBER: _____

There are **5** questions totalling **50** marks. There are **6** pages in the exam.
Please answer all questions on the exam paper. Use the backs of pages if necessary.

_____

Question 1 [10]   Define the following terms as used in the course.

(a) fact:

(b) unification:

(c) logical variable:

(d) singleton variable:

(e) backtracking:

Question 2 [7] For each expression given, indicate the final result when interpreted. If it fails, explain why.

(a) ?- structure(List, Term, Value) = structure(list, [term], 25).

(b) ?- append([1,2,3], [a,b,c], C) = [1, 2, 3, a, b, c].

(c) ?- [A, B | C] = [1, 2, 3, 4, 5].

(d) ?- A=2, C=B, B is 3+2, Z is A+B+C.

(e) ?- fear_factor(Grossout, Compelling, LowBrow) is fear_factor(yes, yes, yes).

(f) ?- member(a, [d, c, b, a]) = X.

(g) ?- X = [a, b], Y = 2, Z = [[Y] | X].

Question 2 [3+6=9 marks]

(a) Consider the following:

```
1:      p([ ], [ ]).
2:      p([E], [ ]).
3:      p([A,B|C], [s(A,B,D)|T]) :- D is A+B, p(C, T).
```

How many clauses are in the above: _____

How many predicates: _____

Identify the facts: _____

Identify the rules: _____

Which variables are "singleton": _____

Which variable can be replaced with an anonymous variable: _____

(b) Draw a complete computation tree for the query: **?- p([1, 2, 3], Ans).**
Clearly indicate the final computed result for Ans.

Question 4 [4+8 = 12]

(a) Write a predicate classify/2. If the first argument is a list, it returns the constant **list** in the second argument. If the first argument is a number, it returns the constant **number**. Otherwise it returns the constant **other**. For example,

```
?- classify(dog, A).
A = other
?- classify([Dog, cat], A).
A = list
?- classify(25, A).
A = number
```

(b) Write a Prolog predicate max_list/2. It takes a list of numbers, and returns the maximum value in the list. Backtracking should result in failure. For example,

```
?- max_list([1,5,2,4,3], Max).
Max = 5;
no
```

Question 5 [12]

Write a predicate binvalue/2. It accepts a list consisting of binary digits. It computes the unsigned value in decimal of that binary number, read from left to right. Feel free to use any additional predicates that might help. No error checking is required on the list entries.
For example,

       ?- binvalue([1,0,1], A).
       A = 5
       ?- binvalue([1, 0, 0, 0], A).
       A = 8
       ?- binvalue([0], A).
       A = 0.

*** The End ***