**COSC 352.001 – Organization of Programming Languages**

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**Project 2**

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**Points:**

**Description of Text/Problem (page 2)**

The symmetric difference of two sets is the [union](https://en.wikipedia.org/wiki/Union_(set_theory)) of both relative complements

{\displaystyle A\,\triangle \,B=(A\smallsetminus B)\cup (B\smallsetminus A),}

The relative complement of two sets *A* and *B*, also termed the set-theoretic difference of *A* and *B* is the set of elements which are in *A* but not in *B*.

The union of two sets *A* and *B* is the set of elements which are in *A*, in *B*, or in both *A* and *B*.

Write in the SWI Prolog programming language predicate symmetricDifference(L1, L2, L3) to compute L3 - symmetricDifference of the set L1 and the set L2.

**Page 3 - Algorithms/Data Structures and Explanations**

The set of elements belonging to one *but not both* of two given sets. It is therefore the union of the complement of A with respect to B and B with respect to A, and corresponds to the XOR operation in Boolean logic.

The symmetric difference of sets A and B is variously written as A circleminus B, Adel B, A+B or ADeltaB. All but the first notation should probably be deprecated since each of the other symbols has a common meaning in other areas of mathematics.

For example, for A={1,2,3,4} and B={1,4,5}, A circleminus B={2,3,5}, since 2, 3, and 5 are each in one, but not both, sets.

The symmetric difference using Venn diagram of two subsets A and B is a sub set of U, denoted by A △ B and is defined by

A **△** B = (A – B) ∪ (B – A)

Let A and B are two sets. The symmetric difference of two sets A and B is the set (A – B) ∪ (B – A) and is denoted by A △ B.

Thus, A **△** B = (A – B) ∪ (B – A) = {x : x ∉ A ∩ B}

or, A **△** B = {x : [x ∈ A and x ∉ B] or [x ∈ B and x ∉ A]}

The shaded part of the given Venn diagram represents **A △ B**.

A △ B is the set of all those elements which belongs either to A or to B but not to both.

A △ B is also expressed by (A ∪ B) - (B ∩ A).

It follows that A △ ∅ = A for all subset A,

             A △ A = ∅ for all subset A

**Page 5 – Program Code**

symmetricDifference([], X, X).

symmetricDifference([H|T1],Set,Z):-

member(H, Set),

!, delete(T1, H, T2),

delete(Set, H, Set2),

symmetricDifference(T2, Set2, Z).

symmetricDifference([H|T], Set, [H|Set2]) :-

symmetricDifference(T,Set,Set2).

**Page 5 – Test Examples**

?- [symmetricDifference].

true

?- symmetricDifference( [a, b, c, d], [x, b, c, y], L).

L = [a, d, x, y]

?- symmetricDifference([a,g,h,f], [a,g,e,f], X).

X = [h, e].

?- symmetricDifference([a,b,c,d,e,f], [f,g,a,b,e,d], M).

M = [c, g].