Qualifying Examination – Fall 1998
Compilers

1. (50 points) Redefine Sethi-Ullman labeling algorithm for expression trees when an expression may contain variable identifiers, integer constants, commutative binary operations, unary operations, and a ternary operation e1 ? e2 : e3 similar to the C conditional expression. Describe the Sethi-Ullman Number (SUN) assignment algorithm using informal pseudocode and provide some rationale for your SUN definition for unary and ternary operation nodes.

2. (50 points) Write an attribute grammar specifying the syntax and attribute evaluation rules for the simple arithmetic expressions described above, containing variables (IDENT tokens), integer constants (NUMBER tokens), binary operation symbols '+', '-', '*', '/', '<', '>', '=', unary '-', ternary '?:' operation, and parentheses.

   The precedence of operations is the same as for the C language. Nonterminals corresponding to expressions should have the attribute SUN which holds the value of Sethi-Ullman number assigned to the expression.