Midterm 2 April, 1992

This is an open book exam. You are to turn in this exam at 8:30 PM.

Name: ________________________________

Problem 1: 30 points

Given the following type definitions and declarations:

```
TYPE
  Seasons  = (Winter, Spring, Summer, Fall);
  SeasonSet = SET OF Seasons ;
  SeasonArr = ARRAY[Seasons] OF INTEGER ;
  List4     = ARRAY[1..4] OF INTEGER ;
  MList2    = ARRAY[1..2] OF List4 ;

VAR
  B: BOOLEAN ;
  C: SeasonSet ;
  I: INTEGER ;
  L: List4 ;
  M: MList2;
  R: REAL ;
  S: Seasons ;
  V: SeasonArr ;
```

Some of the following 20 Pascal statements are valid, that is all their operations are applied to operands of appropriate types and both sides of the assignment or `type compatiatable` (p. 446) and others are not. Circle the statements that are valid.

```
V := V  C := C - Spring
B := Winter IN C  C := [Winter..Summer]
S := C[1]  B := 7 <> 5 AND B
R := V[Summer]  I := M[I]
I := 5  I := B + 7
I := Ord(V)  R := V[Fall]
M[2] := L  B := Fall IN V
M[2][1] := 1992  R := I + 4
I := L[Ord(S)]  I := 0 DIV 3
R := I / 5  B := I <> 5
```
Use the following type declarations in answering the questions on the last two pages of this exam.

TYPE
  VEC20 = ARRAY[1..20] OF INTEGER ;
  MAT20 = ARRAY[1..20] OF INTEGER ;
  BOOL5 = ARRAY[1.. 5] OF BOOLEAN ;
  CHAR8 = ARRAY[1.. 8] OF CHAR ;

Problem 2:  14 points

Write a function that takes a 20 by 20 two-dimensional array of integers, declared as a MAT20 and returns the number of times the value 7 appears within this two-dimensional array. Start with the header:

FUNCTION Num7(M: MAT20): INTEGER;

Problem 3:  14 points.

Write a procedure that takes an array of twenty integers as input and adds 7 to each element of the array. Start with the header:

PROCEDURE Add7(VAR V: VEC3);

Problem 5:  14 points.

Write a procedure that takes an array of eight characters and exchanges adjacent pairs of characters; that is, if the original array is "Toasters", the array is transformed to contain "oTsaetsr". Start with the header:

PROCEDURE SwitchEm(VAR S: CHAR8) ;
Problem 6: 14 points

Write a function that takes an array of five booleans, declared as a BOOL5 and returns TRUE if all elements or the array are TRUE and returns FALSE otherwise. This time you have to provide your own header.

Problem 7: 14 points

The following procedure is supposed to circularly right shift one space the elements of an array of eight characters, that is, "Toasters" is transformed to "sToaster". However, there seems to be a few bugs with the procedure. Find the bugs and show how they can be corrected.

PROCEDURES SwiftRC(S: Char8);
VAR
    I: INTEGER ;
    T: Char8 ;
BEGIN
    T := S[8] ;
    FOR I := 1 TO 8
        S[I+1] := S[I] ;
    END { SwiftRC } ;