Final Exam

9:00 AM, May 1, 1985

Problem 1. (10 points)

Write a LOGO program to delete all occurences of the number 5 from a list. Assume the list is only one deep, that is, the list contains no sublists.

Problem 2. (5 points)

Using the following LOGO functions:

```
TO SQUARE :LEN
REPEAT 4 [FORWARD :LEN  RIGHT 90]
END
TO TRIANGLE :LEN
REPEAT 3 [FORWARD :LEN  RIGHT 120]
END
```

Draw the result of executing the following LOGO statements:

```
SQUARE 10
LEFT 120
TRIANGLE 10
```

Problem 3. (10 points)

Write a BASIC "function" (use `GOSUB` and `RETURN`) to add up the first ten elements of an array. State any assumptions you make about which variables are used to pass and return values.

Problem 4. (10 points)

Write a FORTRAN function to add up the first ten elements of an array.

Problem 5. (10 points)

Consider the following Pascal procedure `P`, with sub-procedures `Q` and `R`. Suppose `P` calls `R` which calls `Q` which recursively calls `Q`. Draw the stack during the second (recursive) call of `Q`. Be sure to show all the variables of the procedures.

Problem 6. (15 points)

List all the binding times you can think of associated with the variables (parameters) `x` and `y` in the following Pascal procedure header:

```
procedure P(x:  integer; var y:  integer) ;
```

Problem 7. (5 points)

Give an example of type coercion in Pascal.

Problem 8. (5 points)

Give an example of a LOGO operator that has a side effect.

Problem 9. (10 points)

Assume a variable `R` has been declared to be of type `OddRecord` defined in the following Pascal type defintion:

```
type OddRecord =
   record
      A: character ;
      B: array[1..5] of array[2..6] of integer ;
      C: array[2..3] of real ;
   end
```

Assuming that `R.A` is placed on the stack at location 1000, where is `R.B[3,4]` located? State any assumptions you make about the alignment and size of elementary data values.

Problem 10. (10 points)

Would you say that the following Pascal statements exhibit a "syntatic" error? Explain your reasons.

```
x := 0 ;
y := 5/x ;
```

Problem 11. (10 points)

Explain how you would simulate Pascal variant records in Fortran. Be brief, one paragraph should do.