

Final  
6 May, 1992

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

Name: \_\_\_\_\_

**Problem 1: 20 points**

Starting with the following type definitions and variable declarations:

```
TYPE
  NoteLetterRange = 'A'..'G' ;
  AccidentalType = (Flat, Natural, Sharp) ;
  NoteType =
    RECORD
      Letter: NoteLetterRange ;
      Accidental: AccidentalType ;
    END ;
  ScaleType = ARRAY [1..8] OF NoteType ;
```

```
VAR
  A: AccidentalType ;
  N: NoteType ;
  S: ScaleType ;
  B: BOOLEAN ;
  C: CHAR ;
  I: INTEGER ;
  R: REAL ;
```

Which of the following 20 ``phrases'' is a valid Pascal statement. *Circle* your choices.

|                    |                             |
|--------------------|-----------------------------|
| C := N.Letter      | IF C < '0' THEN R := ORD(A) |
| S[2] := N          | I := ORD(B)                 |
| WRITE(OUTPUT, R:5) | M.Name := S[3]              |
| C := C + '0'       | I := Sharp                  |
| C < N.Letter       | N.Accidental := S           |
| READLN(INPUT, A)   | IF B THEN X := Y            |
| X := (I+5)/I       | N.Letter := 'H'             |
| M.Name := 'C' ;    | B := A := Flat              |
| B := B OR NOT 2*B  | N.Letter := B               |
| R := .5            | A := I<I+1 AND I+1>I        |

**Problem 2: 10 points**

Assume the following variable declarations:

VAR

```
B, C: CHAR ;
I, J: INTEGER ;
```

The following statements are executed

```
READLN( INPUT, B, I) ;
READ( INPUT, C, J) ;
```

where the INPUT file contains the following lines. (Assume each line starts with the character '7'.)

```
70 71
7
75
```

What are the values of the four variables after these statements are executed?

B =            C =            I =            J =

**Problem 3: 10 points**

Assume the following type definition and variable declaration

TYPE

```
IntPtr = ^ INTEGER ;
```

VAR

```
P, Q: IntPtr;
```

What is written to OUTPUT when the following statements are executed? (If you want partial credit, you ought to draw the pointers and the cells to which they point.)

BEGIN

```
NEW(P) ;
P^ := 5 ;
Q := P ;
Q^ := P^ + 5 ;
WRITELN(OUTPUT, P^, Q^) ;
NEW(P) ;
P^ := 6 ;
WRITELN(OUTPUT, P^, Q^) ;
Q^ := P^ ;
IF (P <> Q) THEN
  Q^ := Q^ + 10 ;
WRITELN(OUTPUT, P^, Q^) ;
```

**Problem 4: 10 points**

Write a Pascal procedure that takes as an argument a single integer  $N$  and then opens the *text* file A:\PROB3.DAT and writes to the file the integers from 1 to  $N$ . Each integer should be written on its own line. Start with the following fragments of Pascal and fill in the rest:

```
PROCEDURE WriteInts(N: INTEGER);  
VAR  
  
BEGIN  
  
END { WriteInts } ;
```

**Problem 5: 10 points.**

Write a WHILE loop *and* associated initialization that reads all the characters of the INPUT file and the sets the character variable C to the largest *lower-case letter* in the file. For example, if the INPUT file contained:

```
There's more than one answer to these questions  
pointing me in a crooked line  
The less I seek my source for some definitive  
The closer I am to fine
```

Your code should set the variable C to 'y'. You may start with:

```
VAR  
  C: CHAR ;
```

Use the following type definition in the next two problems

```
TYPE
  CHAR20 = ARRAY[1..20] OF CHARACTER ;
```

**Problem 6: 10 points.**

Write a function that takes an array of twenty characters as input and returns the number of times any of the letters 'I', 'O', and 'U' appear in the array. Start with:

```
FUNCTION CountIOU(S: CHAR20): INTEGER ;
VAR
```

```
BEGIN
```

```
END { CountIOU } ;
```

**Problem 7: 10 points.**

Write a procedure that takes an array of twenty characters and replaces any two consecutive occurrences of the characters 'ei' with the characters 'ie'. For example, if the procedure is passed an array containing

'I believe, U receive'

the array will be modified so that it contains

'I believe, U recieve'

Start with:

```
PROCEDURE IE2EI(S: CHAR20): INTEGER ;
VAR
```

```
BEGIN
```

```
END { IE2EI } ;
```

**Problem 8: 10 points**

Write a definition of a record type to be used for used musical instrument store. The following information should be included in your record:

Name of instrument (up to 20 characters)

Age

Price

```
TYPE
  Char20Type = ARRAY[1..20] OF CHARACTER
  InstrumentType =
    RECORD
      ...
    END { InstrumentType } ;
```

**Problem 9: 10 points.**

Write a few lines of Turbo Pascal that uses the Turbo graphics interface to draw a green rectangle with vertices at points (50,100), (150,100), (50, 170), (150, 170).

Assume that the graphics display has already been initialized with a call to `InitGraph`.