

**PRIFYSGOL CYMRU; UNIVERSITY OF WALES**

**DEGREE EXAMINATIONS JANUARY 2002**

**SWANSEA**

**Computer Science**

**CS 111 Program Design**

**Attempt 2 questions out of 3**

**Time allowed: 2 hours**

**Students are permitted to use the dictionaries provided by the University through the invigilators**



**CS\_111**  
**PROGRAM DESIGN**  
*(Attempt 2 questions out of 3)*

**Question 1**

- a. Give the syntax for the three main loop structures provided in Delphi and briefly explain how they operate. For each loop structure either show how it can be used to simulate each of the others, or explain why it cannot simulate the other structures.

**[12 marks]**

Consider the following program which is intended to read a series of numbers from a file (one per line), and output them to another file in reverse order (one per line). It compiles correctly, but does not behave as intended.

- b. What would you expect to be the result of executing this program as given? Explain your answer.

**[3 marks]**

- c. Carefully explain what changes would be needed to make the program execute correctly. Indicate how each of the errors you identify would affect the execution of the program.

**[10 marks]**

```
program exam(input,output);
{$APPTYPE CONSOLE}
uses SysUtils;
const max = 100;
type storage = array[1..max] of integer;
var myinfo : storage;
    source, destn : text;
    where : string;
    i : integer;
begin writeln('Please input source name');
    readln(where);
    assign(source,where);
    reset(source);
    while not eof
    do begin read(source,myinfo[i]);
            i:=i+1
        end;
    writeln('Please input destination name');
    readln(where);
    assign(destn,where);
    reset(destn);
    for i:=max downto 1
    do writeln(destn,myinfo[i]);
    writeln('finished')
end.
```

## Question 2

- a. Define a suitable enumerated type to represent the days of the week. What are the advantages of defining an enumerated type? **[4 marks]**

- b. Given that the day of the week is to be read from a file using the following code:-

<u>value on file</u>	<u>day of the week</u>
1	monday
2	tuesday
3	wednesday
4	thursday
5	friday
6	saturday
7	sunday

Define a function to read a code from the file and return a value of enumerated type `days`, and a procedure which given a value of the enumerated type will output to a file a string containing the day. **[8 marks]**

- c. Define a set type, `working`, to represent the days of the week a person works. What are the limitations on the types that can be used as the base types of sets? **[3 marks]**

- d. Write procedures or functions that :-

- i) will write out all the days which someone is not working, given a value of type `working` containing the days they are working. **[5 marks]**
- ii) given two values of type `working` representing the days two people are working, will return a value of type `working` representing the days of the week when neither person is working. **[5 marks]**

### Question 3

- a. Explain the difference between the *top-down* and *bottom-up* approaches to program design and discuss their relative merits.

[9 marks]

- b. If a version of Delphi or Pascal you were using did not provide access to a built-in debugger describe what statements you could add to your code in order to provide the equivalent of *trace* facilities and *breakpoints*. How could you arrange for these facilities to be switched on and off without modifying your code extensively?

[6 marks]

- c. Consider the following procedure which is intended to read in a series of names and store them in a linked list.

```
procedure readlist( source : text; count : integer);
var temp : listentry;
begin while not eof
      do begin count := count + 1;
            readln(source, aname);
            temp^.thisone := aname;
            temp^.next := thelist;
            thelist := temp
          end
end
```

This procedure contains a number of errors of three basic types :- compile-time, run-time, and stylistic (*ie* would not stop the code from executing correctly, but which are bad practice). Rewrite the code identifying the errors and indicating which type of error they are. Also include any additional declarations that need to be included in the main program.

[10 marks]