



# UNIVERSITY *of* LIMERICK

O L L S C O I L L U I M N I G H

COLLEGE *of* INFORMATICS *and* ELECTRONICS  
Department of Computer Science  
and  
Information Systems

## Repeat Assessment Paper

**Academic Year:** 2006/2007

**Module Title:** Leveraging Legacy Applications

**Duration of Exam:** 2.5 hours

**Lecturer:** Michael Coughlan

**Semester :** 2

**Module Code:** CS4558

**% of Total Marks:** 100%

**Paper marked out of:** 100

### Instructions to Candidates.

Attempt **all** questions.

Question 1	Renovation	(40 marks)
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Question 2	General	(60 marks)
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## Q1. Renovation

Examine the program fragment below and -

- (a) For each paragraph in the program state whether or not it is an *internal-procedure-like* paragraph and give the reasons why it is, or is not, such a paragraph. (10 marks)
- (b) For a paragraph you have nominated as an *internal-procedure-like* paragraph, identify its Localizable and Pseudo Localizable variables, state which is which, and state the criteria by which you so identify these variables. (14 marks)
- (c) Show, by producing a skeleton of the program fragment highlighting the required changes, how the *internal-procedure-like* paragraph you selected can be converted into a parameterized Contained Subprogram. State the criteria used to identify the parameterizable variable(s) and the parameter passing mechanism(s). (16 marks)

```
DATA DIVISION.
FILE SECTION.
FD  StudentFile-CSV.
01  StudentRec-SF          PIC X(100).

WORKING-STORAGE SECTION.
77  StudentName            PIC X(30).
77  StudentAddress         PIC X(70).
77  CountyNum              PIC 99.

01  UnstringPointer        PIC 99.
   88 EndOfAddress         VALUE 71.

01  CIdx                   PIC 99.
   88 NoValidCounty        VALUE ZEROS.

01  DisplayLine.
   02 CountyNamePrn         PIC X(9).
   02 FILLER                PIC X(6) VALUE SPACES.
   02 CountyTotalPrn        PIC ZZ,ZZ9.

01  CountyCount OCCURS 26 TIMES PIC 9(5).

01  CountyNameTable.
   02 TableValues.
       03 FILLER PIC X(18) VALUE "Carlow   Cavan".
       03 FILLER PIC X(18) VALUE "Clare    Cork".
       03 FILLER PIC X(18) VALUE "Donegal  Dublin".
       03 FILLER PIC X(18) VALUE "Galway   Kerry".
       03 FILLER PIC X(18) VALUE "Kildare  Kilkenney".
       03 FILLER PIC X(18) VALUE "Laois    Leitrim".
       03 FILLER PIC X(18) VALUE "Limerick Longford".
       03 FILLER PIC X(18) VALUE "Louth    Mayo".
       03 FILLER PIC X(18) VALUE "Meath     Monaghan".
       03 FILLER PIC X(18) VALUE "Offaly   Roscommon".
       03 FILLER PIC X(18) VALUE "Sligo    Tipperary".
       03 FILLER PIC X(18) VALUE "WaterfordWestmeath".
       03 FILLER PIC X(18) VALUE "Wexford  Wicklow".
   02 FILLER REDEFINES TableValues.
       03  CountyName  PIC X(9) OCCURS 26 TIMES
                           INDEXED BY NameIdx.
```

```

PROCEDURE DIVISION.
Begin.
    OPEN INPUT StudentFile-CSV
    PERFORM CountCounties.

DisplayResults.
    DISPLAY "Student County Totals"
    DISPLAY "CountyName      CountyTotal"
    PERFORM VARYING NameIdx FROM 1 BY 1 UNTIL NameIdx > 26
        SET CIdx TO NameIdx
        MOVE CountyName(NameIdx)    TO CountyNamePrn
        MOVE CountyCount(CIdx)      TO CountyTotalPrn
        DISPLAY DisplayLine
    END-PERFORM
    CLOSE StudentFile-CSV
    STOP RUN.

CountCounties.
    READ StudentFile-CSV
        AT END GO TO DisplayResults
    END-READ
    UNSTRING StudentRec-SF DELIMITED BY ","
        INTO StudentName, StudentAddress
    PERFORM GetStudentCountyNum
    MOVE CountyNum TO CIdx
    IF NoValidCounty
        DISPLAY "No valid county found in address"
    ELSE
        ADD 1 TO CountyCount(CIdx)
    END-IF
    GO TO CountCounties.

GetStudentCountyNum.
    MOVE 1 TO UnstringPointer.
    UNSTRING StudentAddress DELIMITED BY ALL SPACES
        INTO CountyNamePrn
        WITH POINTER UnstringPointer.
    PERFORM UNTIL EndOfAddress
        UNSTRING StudentAddress DELIMITED BY ALL SPACES
            INTO CountyNamePrn
            WITH POINTER UnstringPointer
    END-PERFORM
    SET NameIdx TO 1
    SEARCH CountyName
        AT END MOVE ZEROES TO CountyNum
        WHEN CountyName(NameIdx) = CountyNamePrn
            SET CountyNum TO NameIdx
    END-SEARCH.

```

**Q2. General**

- (a) Briefly describe the characteristic problems that make legacy systems difficult to maintain and enhance. (10 marks)
- (b) In “Extracting Business Rules from Source Code”, Sneed describes a method for identifying and extracting the business rules from the surrounding source code.
  - i. Briefly explain what Sneed means by the term “Business Rule”. (5 marks)
  - ii. Assume that we have been able to identify the output results of a system’s Business Rules. Describe a method for identifying and extracting the code implementing those Business Rules from the surrounding application source code. (13 marks)
- (c) Some of the guest lectures highlighted the importance of the “human factor” as an element of the migration process. Briefly outline why the “human factor” is regarded as so important for ensuring the success of a project and comment on the sources of discontent when this factor is neglected. (10 marks)
- (d) One of the most important tasks of data migration is “data cleaning”. Briefly describe the types of problems typically exhibited by legacy system data. (10 marks)
- (e) Identify and describe three different approaches that might be considered when a legacy system needs to be modernized. Comment on the cost, difficulty, effectiveness, and chance of success of each of these approaches. (12 marks)