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

Assessment Paper

Instructions to Candidates.

4 questions. Attempt 3 **only**. All questions carry equal weight.

Question 1	Renovation	(50 marks)
Question 2	Language Conversion	(50 marks)
Question 3	Modernisation	(50 marks)
Question 4	Legacy Systems – General	(50 marks)

Q1. Renovation

(a) Examine the program fragment below and -

   i. Identify **one** internal-procedure-like paragraph within the program and state the criteria which allow you so to identify the paragraph. (6 marks)

   ii. For the paragraph you have nominated, identify its Localizable and Pseudo Localizable variables, state which is which, and state the criteria by which you so identify these variables. (14 marks)

   iii. Show, by producing a skeleton of the program fragment which highlights 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)

```
WORKING-STORAGE SECTION
77 StartVal      PIC 999.
77 RecsToRead    PIC 999.
77 Cidx          PIC 999.
77 Males         PIC 999.
77 Females       PIC 999.
77 Quotient      PIC 999.
77 Remain        PIC 9.

PROCEDURE DIVISION.
Begin.
   DISPLAY "Enter number of student records to read"
   ACCEPT RecsToRead.
   MOVE RecsToRead TO StartVal
   PERFORM CountDown.
   OPEN INPUT StudentFile
   PERFORM CountStudents
   DISPLAY "Loop terminated normally".

DisplayResults.
   DISPLAY "Male students = " Males
   DISPLAY "Female students = " Females
   CLOSE StudentFile
   STOP RUN.

CountDown.
   DIVIDE StartVal BY 2 GIVING Quotient REMAINDER Remain
   IF Remain = ZEROS DISPLAY "Should be an even number of records"
     ELSE DISPLAY "Should be an odd number of records"
   END-IF
   DISPLAY "Starting countdown now"
   PERFORM VARYING Cidx FROM StartVal BY -1 UNTIL Cidx < 1
      DISPLAY "Count = " Cidx
   END-PERFORM
   DISPLAY "About to start counting students".

CountStudents.
   PERFORM VARYING Cidx FROM 1 BY 1 UNTIL Cidx > RecsToRead
      READ StudentFile AT END GO TO DisplayResults
      END-READ
      DISPLAY "Counting student number " Cidx
      IF MaleStudent ADD 1 TO Males
        ELSE ADD 1 TO Females
      END-IF
   END-PERFORM.
END PROGRAM Main-Program.
```

(b) Suppose that a previously monolithic legacy system has been partitioned into a number of contained subprograms. Suggest, and with the aid of diagrams briefly describe, a method that might be used to identify those that might usefully be converted into external subprograms (i.e. into reusable subprograms). (14 marks)

Q2. Language Conversion

(b) In "The Realities of Language Conversions", the authors note that one task of automated language conversion is to convert the "native language constructs" of the source language to native or simulated constructs in the target language. They note that "COBOL contains a rich set of constructions to deal with rather sophisticated data-processing tasks." In a conversion of an application written in COBOL to a language like C++ identify five native COBOL constructs that might have to be simulated in the target language? (8 marks)

(c) What is "data type emulation" and why would it be necessary if we were converting a COBOL application to a language like C++? (13 marks)

(d) What drawbacks/problems might be experienced with data type emulation? (6 marks)

(e) In "The Realities of Language Conversions" the authors note that "any sensible language conversion should first start with extensive restructuring" briefly outline the purpose of this restructuring. (6 marks)

(f) Ulrich states that "Planning teams should be careful not to attempt to "convert" a procedural language, such as COBOL, to an object-oriented language, such as JAVA or C++." Briefly describe why such a conversion could be deemed undesirable. (8 marks)

(g) Management and user perception that a great deal of money is about to be spent to no useful effect is often an impediment to modernisation plans such as language conversion. Ulrich suggests a Phased Deployment approach as a solution to this problem. Briefly outline the advantages of this suggested solution, and identify, and comment on, one phase which will be common to most invasive modernisation strategies. (9 marks)

Q3. Modernisation

(a) Legacy systems are difficult to maintain and difficult to enhance. Yet despite these difficulties revitalizing a legacy system is often seen as a more desirable alternative to redeveloping it. Briefly explain why renovation is so often seen as a preferable alternative to redevelopment. (10 marks)

(b) Briefly explain what you understand by the term "Business Rule". Use examples taken from the Hotel Reservation Project to support your answer. (8 marks)

(c) Assuming that the output results of Business Rules could be identified, describe a method for identifying and extracting the code representing the Business Rules from the surrounding application source code. (12 marks)

(d) Most approaches to legacy system modernisation should start by thoroughly documenting the existing legacy system. In the "Commercial Software Reengineering Workbench", Sneed describes 10 basic view documents produced by the workbench. Identify the 10 basic view documents produced by the SOFREDOC program and provide a brief description of four of them, noting the use that might be made of them. (14 marks)

(e) By means of an analogy explain why so many different types of documentation are needed. (6 marks)

Q4. Legacy Systems - General

(a) Define the term "Legacy System" and offer a brief explanation of your definition.

(4 marks)

(b) Software maintenance is normally classified by the reason(s) for which it is undertaken. Provide such a classification and briefly explain the purpose of each type of maintenance.

(12 marks)

(c) Software maintenance of legacy systems is often difficult, expensive, and time consuming. Briefly outline the factors that make maintenance of legacy systems so problematic.

(12 marks)

(d) Identify and describe the factors that might prompt Legacy System Modernisation.

(10 marks)

(e) One way to reduce the risks of data migration is through Data Definition Rationalization, Data Cleanup, Data Redundancy Consolidation. Briefly define each of these terms and outline how they might reduce the risk involved in data migration. (12 marks)