NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCES
DEPARTMENT OF COMPUTER SCIENCE
MAY 2005 EXAMINATIONS

SUBJECT: PROGRAMMING AND PROGRAM DESIGN
CODE: SCS1201

INSTRUCTIONS TO CANDIDATES

Answer all questions in Section A and any three from Section B.
Total marks 100

TIME: 3 HOURS

SECTION A

QUESTION 1

(i) Functional Completeness and Compliance with Constraints are program qualities achievable by program design. Explain what you understand by Functional Completeness and Compliance with Constraints. [2]

(ii) State and explain 8 other program qualities achievable by design. [8]

QUESTION 2

(i) By use of an appropriate example describe the bottom up design process. [5]

(ii) Compare and contrast Top-Down design and Bottom-Up design. [5]

QUESTION 3

(a) Give the advantages of achieving the following two program design principles: reducing coupling where possible and increasing cohesion where possible. [2]

(b) Describe the following

(i) Sequential Cohesion [1]
(ii) Temporal cohesion [1]
(iii) Content Coupling [1]
(iv) Common Coupling. [1]

(c) Write two C functions to demonstrate control coupling [4]

QUESTION 4

(a) Structured design is a way to achieve programs that are composed of only single-entry and single-exit control constructs in a hierarchical fashion.

(i) State four advantages of achieving programs that are composed of only single-entry and single-exit control constructs. [4]

(ii) What are the three kinds of single-entry and single-exit constructs used in structured design? Draw JSP implementations of these constructs. [6]

SECTION B

QUESTION 5

(i) Draw a flowchart for a program that produces the following Multiplication table as output. (10)

```
1
2  4
3  6  9
4  8  12 16
5  10 15 20 25
6  12 18 24 30 36
7  14 21 28 35 42 49
8  16 24 32 40 48 56 64
9  18 27 36 45 54 63 72 81
10 20 30 40 50 60 70 80 90 100
```

(ii) Produce the Pseudocode to the problem [5]

(iii) Produce the corresponding C program [5]

QUESTION 6

A file processing system reads a text file consisting of some sentences of text and outputs each word in each sentence of the input file as a separate line of output. A word is defined as any sequence of letters and apostrophes.

(i) What are the five main steps of the JSP process? [5)]

(ii) Using the five main steps of the JSP process produce the structure diagram and pseudocode for the file processing system. [15]

QUESTION 7

(a) For each of the following draw a corresponding Nassi Schneiderman diagram.

(i)	Do ... While	[1]
(ii)	While ... Do	[1]
(iii)	Switch ... Case	[1]
(iv)	For loop	[1]
(v)	Nested For Loop	[1]

(b) A Program accepts a positive non-zero number as input from the keyboard. If the number is greater than three it print outs the statement,'Entry not found' then exits the program. If the number is one it draws a circle on the screen. If the number is two it draws a square. If the number is three it prints out the statement, 'good bye' and exits the program.

(i)	Produce the Nassi Schneiderman diagram for the above program.	[10]
(ii)	Produce the C program to the problem	[5]

QUESTION 8

The University of Lupane enrolls students each year and gives them student IDs. The university has a number of Departments, lecturers and a maximum enrolment. Each department offers a number of courses to students at each level. Each department has a Chairperson who is also a lecturer. Students register with the department to take courses offered at their level or year. Each course has a lecturer and lecturers teach students taking that course. A course has a level or year at which it is taken and is described using its course code. The course is also done in one of the two semesters in the year at which it is taken.

(a) Explain with the assistance of a diagram where possible what you understand by the following terms

(i) Objects and Classes	[2]
(ii) Information hiding	[2]
(iii) Inheritance	[2]
(iv) Polymorphism	[2]
(v) Encapsulation	[2]

(b) Draw a class diagram for the University of Lupane. [10]

END OF QUESTION PAPER