

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCE
COMPUTER SCIENCE DEPARTMENT
AUGUST SUPPLEMENTS EXAMINATIONS 2004

SUBJECT: STRUCTURED PROGRAMMING
CODE: SCS2107

INSTRUCTION TO CANDIDATES

Answer any 4 questions

3 HOURS

QUESTION ONE

1.

Write a structured program in C that accepts the parameters of a quadratic equation in the form $ax^2 + bx + c = 0$ as inputs, where a, b and c are constants. The program should produce as outputs the roots of the quadratic equation. Make provision for all cases; that is for real and different roots, real and equal roots and complex roots. Hint: start with a clear derivation of the mathematics behind the problem.

[25]

QUESTION TWO

Write a structured program in C that makes use of an array to store the first 100 prime numbers, starting with 2. Use an algorithm based on the Sieve of Eratosthenes to determine whether or not a number is prime. Once the array has been populated, the program should print it out. Hint: start with a clear explanation of your algorithm.

[25]

QUESTION THREE

The Fibonacci sequence can be specified as a sequence $x_i = \begin{cases} 1, & i = 0 \\ 1, & i = 1, \\ x_{i-1} + x_{i-2}, & i \geq 2 \end{cases}$, where

$i \in N$ (i.e., is a natural number) and $x \in R^\#$ (i.e., is a real number).

(a) Write a recursive function in C, with the header `long Fib(long n)`, which accepts a long as a parameter and returns a long which is the Fibonacci sequence number corresponding to the input n .

[12]

(b) Write an iterative function, with the header `long Fibonacci(long n)` which calculates the same output as the function in (a).

[13]

QUESTION FOUR

(a) Explain the structured programming terms:

(i) Cohesion

[3]

(ii) Coupling

[3]

(iii) Top-down decomposition

[3]

(iv) Stepwise refinement

[3]

(b) Write a function with the header `void PrintStars(int n)` which produces the following output:

N=3

*

*

N=5

*

*

[13]

QUESTION FIVE

Write a menu driven structured program in C, to carry out the following arithmetic operations. Ensure that you use the provided function headers:

(a) Addition to add two real numbers together. Use the function header `void Add(float a, float b, float *cp)`.

[6]

(b) Subtraction to return the difference between two real numbers. Use the function header

`float Subtract(float a, float b)`.

[6]

(c) Multiply to multiply two numbers together. Use the function header `void Multiply(float a, float b, float *cp)`.

[6]

(d) Divide to return the quotient of two real numbers. Use the function header `float Divide(float a, float b)`.

[7]

END OF QUESTION PAPER

GOOD LUCK!