

OLLSCOIL NA hÉIREANN
THE NATIONAL UNIVERSITY OF IRELAND, GALWAY

SUMMER EXAMINATIONS 2000

FIRST YEAR BSc(IT) INFORMATION TECHNOLOGY
FIRST YEAR ENGINEERING (ELECTRONIC AND COMPUTING)
FIRST YEAR ELECTRONIC ENGINEERING

CT103 PROGRAMMING

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Time allowed: THREE hours

ANSWER ANY FIVE QUESTIONS
All questions carry equal marks

1. (a) Describe the different stages of the Software Development Method. For each stage justify the advantages of including it in the development process.

[12]

- (b) Illustrate how you would use the Software Development Method to solve the following problem:

Write a program to take a value in metres and centimetres and display its corresponding value in yards, feet and inches. Use the conversion factor
2.54 cm = 1 inch.

[12 inches = 1 foot; 3 feet = 1 yard] [100 cm. = 1 metre]

[8]

2. (a) Write short notes on each of the following, illustrating your answer with a small example in each case:

coverage testing ; extreme testing ; whitebox testing ; blackbox testing

[12]

- (b) Develop a test plan for the following C program, explaining why you would perform each test:

Three lengths can form a triangle if the longest side is less than the sum of the other two. The program should accept three (integer) lengths and print to screen a message indicating whether or not they can form a triangle.

[8]

3. (a) Describe the operation of counter-controlled loops and sentinel-controlled loops. For each explain how the initialisation, termination and progress is handled and illustrate your answer with a small example. [6]

- (b) Develop a piece of code in C that reads a number n and prints n lines of the table:

```
1
2 3
3 4 5
4 5 6 7
5 6 7 8 9
```

[10]

- (c) What test cases should be designed in order to ensure coverage testing of the example in (b)? [4]

4. (a) Explain the meaning of the term *pointer* in the C programming language and give an example of the use of a pointer. [4]

- (b) Develop a function in C with prototype

```
int search_array(int my_array [ ], int size, int x);
```

which returns the position of the first occurrence of x in `my_array`.

`my_array` has `size` elements. The function `my_array` should return `-1` if x is not found. [12]

- (c) How could you improve your algorithm for the problem in (b) if you knew that the values in `my_array` are held in descending numerical sequence? [4]

5. (a) Distinguish between the action of the functions

```
scanf("%s", name);
gets(name);
```

which read data into the array `char name[20]`. What are the advantages and disadvantages of each? [6]

- (b) Write a piece of C code which accepts a string from the keyboard and calculates the frequency of occurrence of each of the five vowels. (aeiou). An example of I-O might be:

```
Please enter your sentence> Now is the time for all good men to
come to the aid of the party
```

```
a occurs 3 times
e occurs 6 times
i occurs 3 times
o occurs 8 times
u occurs 0 times
```

[14]

6. (a) Explain what happens when a C program attempts to read from a file after having read the last entry on the file? How do we cater for this within a program? [4]

(b) An input text file, `numbers.dat`, contains a list of integer numbers. Write a piece of C code which reads the file and copies any even numbers to the file `evens.dat` and any odd numbers to the file `odds.dat`. Give declarations for any variables you use. [16]

7. (a) A manufacturing company produces 50 different products. They wish to computerise their records, holding the following information on each product:

name
cost
stock level

Define a structured data type `product_t` to suit this data. Give declarations of a variable `product1` of this type. Write a C function called `scan_product` to accept data for a particular product into your variable `product1` [12]

(b) Write a piece of C code which declares an array representing the product details and which reads details of all products. Make use of the `scan_product` function you have just written. [8]

8. (a) The meteorology office has been keeping a record of the daily temperature high for the past six weeks. Write a program which will initialise an array with this data. The program should then allow input of a temperature range and print out the days (week number and day number) which have temperatures in this range. [10]

(b) Write a program in C to read the values of a 5 x 7 matrix and report on the minimum row sum. Sample input and output might be:

4	9	2	7	6
3	6	3	8	6
2	7	2	1	3
9	2	8	5	4
1	5	7	2	5

The minimum row sum is 15. [10]