

OLLSCOIL NA hÉIREANN
THE NATIONAL UNIVERSITY OF IRELAND, GALWAY

SUMMER EXAMINATIONS 2000

FIRST YEAR BA INFORMATION TECHNOLOGY

CT100 PAPER 1
Programming and Logical Methods

Professor. D. Bell
 Dr. G. Lyons
 Mr. H. Melvin

Time allowed: THREE hours

Answer Q1 and three other questions.

All questions carry equal marks

Note 1: Where you are asked to write programs, it is sufficient to include a brief algorithm with your code.

- Q1.** (i) Briefly outline and describe the main steps in the Software Development Method (SDM). What are the advantages of using this method? (10)
- (ii) Distinguish between arithmetic, relational and logical operators. Show how each are used in QBasic. (8)
- (iii) Write a brief note on operator hierarchy and show where arithmetic, relational and logical operators are positioned in this hierarchy. Use examples to illustrate your answer. (10)
- (iv) Write short notes on two (2) of the following: (12)
- (a) Input validation
 - (b) Top-down design
 - (c) Pass by reference (with regard to SUBs)
 - (d) The FOR...NEXT loop statement
- Q2.** (i) Outline and explain the general format of the block IF statement and the SELECT CASE statement in QBasic. (7)
- (ii) Distinguish between pre-test and post-test loops in QBasic, outlining where each might be used. (7)

(7)
PTO

- (iii) You are asked to design and code a computer system to calculate employee gross salaries.
The system should function as follows:

- Prompt the user for the number of employees and the hourly pay-rate that applies to all employees. Use input validation to ensure that both of these values are positive.
- For each user, read in the hours worked per week. Use input validation to ensure that the hours are between 0 and 100 inclusive (≥ 0 and ≤ 100). Calculate and print the gross salary using the following formula:

$$\text{Gross salary} = \text{Hours worked} * \text{Hourly rate} \quad (26)$$

- Q3.** (i) Distinguish between a SUB procedure and a user-defined FUNCTION procedure in QBasic.

(10)

- (ii) A company manager has asked you to design and code a payroll system for all employees.
The system should function as follows:

- Prompt the user for the number of employees.
- Carry out the following processing for each employee:
 - Read in the relevant employee details:
 - Gross salary
 - Tax rate in percent (0-100)
 - PRSI rate in percent (0-100)
 - Use this data to calculate the net salary using the following formula:

$$\text{Net salary} = \text{Gross salary} - (\text{Tax rate} + \text{PRSI rate}) * 0.01 * \text{Gross salary}$$

- Prints out all of these details for each employee

Note: Use SUB procedures to read in the data for each employee **and** to print out all the final details for each employee. Use a SUB **or** user-defined FUNCTION to calculate the net salary for each employee.

(30)

- Q4.** (i) Write brief notes on two (2) of the following QBasic library functions:

- RND
- LEN()
- MID\$()

(10)

- (ii) Write a program that reads in three (3) numbers eg. X, Y, Z and then uses FUNCTIONS to calculate the SQUARE ROOT of the following expression:

$$(X + Y) * Z \quad (10)$$

PTO

- (iii) Write a program that processes strings as follows:
- Prompts the user for two strings
 - Concatenates the two strings and prints out the result
 - Uses a user-defined FUNCTION to calculate the number of digits (0-9) and the number of non-digits in the concatenated string and prints out the results.
- (20)
- Q5.** (i) Explain briefly the importance of arrays in QBasic.
- (5)
- (ii) You are asked to design and code a system that processes windspeeds at a single location. The windspeeds are measured ten (10) times per hour.
The system should function as follows:
- Prompt the user to enter the 10 speeds into the system.
 - Calculate the average speed and print this out, along with details indicating how much each measurement deviates from the average.
- (15)
- (iii) Modify the system from (ii) above to allow windspeed measurements from five (5) different locations to be entered. Show how a 2-dimensional array can be used for this purpose and write code that reads in the 10 measurements for each of the five locations.
- (10)
- (iv) **Briefly** describe the bubble sort technique for sorting data.
(Note that QBasic code is **not** required).
- (10)
- Q6.** (i) Explain briefly the use of the record type in QBasic
- (5)
- (ii) A company wishes to computerise its employee records. The system it requires should store the following data on each employee:
- Name
 - Date of birth (dd/mm/yyyy format eg. 12/02/1981)
 - Identity number
 - Holidays left to take
- Show how a record type could be used to group the above data on each employee.
- (10)
- (iii) The company from part(ii) above employs 10 people. Write a program that will allow the user to input the details for each of the ten employees. The system should then print out the details in a neat format.
- (15)
- (iv) Distinguish between sequential and random access in files. Using the record type from part (ii) above, indicate how you would open up a file of employee details using random access.
- (10)