

FACULTY OF MECHANICAL ENGINEERING
UNIVERSITI TEKNOLOGI MALAYSIA

SEMESTER 2-2005/2006

SME 1013 PROGRAMMING FOR ENGINEERS
Date: 25 February 2005

Test 1
Duration: 60 minutes

Answer ALL questions in English.

1. In programming, the three basic building blocks to develop a solution to a problem are

- *sequential executions*
- *branching operations*
- *looping operations*

Explain what these three building blocks mean.

Show the flowchart symbol for a typical

- (a) conditional transfer in branching operations
- (b) conditional loop in looping operations
- (c) counted loop in looping operations

[10 marks]

2. The roots of the quadratic equation

$$ax^2 + bx + c = 0$$

are characterized by the value of the discriminant, $d = b^2 - 4ac$. When

- $d > 0$: there are two real roots (x_1 and x_2)
- $d = 0$: there is only one real root (x_1)
- $d < 0$: there are two imaginary roots

Given a, b, c and $a \neq 0$, construct an algorithm and a flowchart to calculate the roots. You may use Select... Case structure if you so wish.

[20 marks]

3. You are asked to write a program to calculate the average weight of glass bottles coming out from a conveyor belt. You, however, do not know in advance how many there will be. So you setup a loop to read in the weights, one at a time, until

- one of the weights is greater than a value of 250 g, at which point the loop will stop — this value is called a *sentinel* value,

OR

- the maximum number of bottle per batch of 100 is reached.

Construct an algorithm and a flowchart for your program that will watch for this sentinel value as a signal to stop reading the weights and proceed to calculate the average weight.

[20 marks]