

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

**SUBJECT:** OBJECT ORIENTED SOFTWARE CONCEPTS AND DEVELOPMENT  
[JAVA]  
**CODE:** SCS4102

**INSTRUCTION TO CANDIDATES**

Answer any 5 questions  
Write all code in Java

**3 HOURS**

**QUESTION ONE**

Write a class which implements a square matrix of floats. Include the following methods:

- (a) input, to accept as input a matrix of up to 50 x 50 in size. [2]
- (b) transpose, to return the transpose of the current matrix. [8]
- (c) add, to return the sum of two matrices. [2]
- (d) multiply, to return the product of two matrices. [8]

**QUESTION TWO**

Define the following terms:

- (i) IOException [2]
- (ii) Object [2]
- (iii) this [2]
- (iv) public [2]
- (v) int [2]
- (vi) extends [2]
- (vii) implements [2]
- (viii) final [2]
- (ix) float [2]
- (x) void [2]

### QUESTION THREE

Design and implement a Swing application which plays the role of a simple calculator. [20]

### QUESTION FOUR

Implement a shape hierarchy of classes. Each class should be capable of:

- (a) reporting its name; [3]
- (b) accepting data pertaining to its area; and [5]
- (c) calculating and reporting its area. [12]

### QUESTION FIVE

Write a program which accepts an integer as input and produces that many lines of pascal's triangle as output. The triangle has the following form:

$$\begin{array}{c} \begin{pmatrix} 0 \\ 0 \end{pmatrix} \\ \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad \begin{pmatrix} 1 \\ 1 \end{pmatrix} \\ \begin{pmatrix} 2 \\ 0 \end{pmatrix} \quad \begin{pmatrix} 2 \\ 1 \end{pmatrix} \quad \begin{pmatrix} 2 \\ 2 \end{pmatrix} \end{array}$$

[20]

### QUESTION SIX

Write a class that accepts up to 50 numbers into a vector. The class should include methods to perform the following operations

- (a) Determine the largest number in the vector and output it. [5]
- (b) Determine the second largest number in the vector and output it. [5]
- (c) Determine the sum of the numbers in the vector and output it.  $sum = \sum_{i=0}^{n-1} x_i$  [5]
- (d) Determine the mean of the numbers in the vector and output it.  $\bar{x} = \frac{1}{n} \sum_{i=0}^{n-1} x_i$  [5]

### QUESTION SEVEN

Explain the model-view-controller concept as used in swing, with respect to the JTextField object [20]

**END OF QUESTION PAPER**

**GOOD LUCK!**