

**University of Swaziland**  
**Faculty of Science**  
**Department of Computer Science**  
**Final Examination, December 2007**

Title of Paper: Computer Organisation II

Course Number: CS341

Time Allowed: Three (3) hours

Instruction: Answer five (5) questions. Questions carry equal marks.

You are reminded that in assessing your work, account will be taken of the accuracy of the material, of the language used and the general quality of expression, together with the layout and presentation of your answer. Remember full answers will usually *define, explain and exemplify*. The use of a calculator is prohibited.

Special Requirement:

Calculators are prohibited.

This examination paper should not be opened until permission has been granted by the invigilator.

Question 1. [20]

Justify your opinion of the minimum set of command types needed in a text editor.  
Give the commands which implement each of your chosen command types in an editor of your choice.

Question 2. [20]

Explain with a block diagram, the commonest and simplest cache mechanism.  
What problem is likely to arise with this simple scheme?  
How is the solution to this problem usually implemented?

Question 3. [20]

- a) What is the purpose of the *instruction buffer* in PicoJavaII?
- b) Briefly explain all the *shift operations* possible.
- c) Expand the IA64 acronym *EPIC* and briefly explain each word.
- d) What is a *macro definition*?
- e) What is the range of numbers that can be represented using 1s complement in 7 bits?

Question 4. [20]

Explain, with the block diagrams of the associated structures, the operation of this program snippet:

```
BIPUSH    210
BIPUSH    310
INVOKEVIRTUAL ADD
5010
```

Question 5. [20]

Construct the program in hexadecimal and then the symbol table for this program snippet, where the mnemonics have their conventional meanings introduced in the course:

---

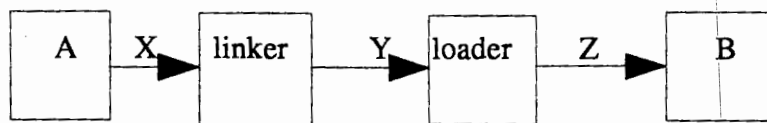
```
// test program
        EQU        SIX        6
        EQU        FIVE       1
        ENT        TOWERS     //execution starts here
        EXT        Sqrt

TOWERS: BIPUSH     6
        ILOAD     FIVE
        ISUB
L1:     ILOAD     3
        IADD
        ISTORE   2
        IF_ICMPEQ L1
        IRETURN
        END      // of test
```

---

Question 6. [20]

This is a block diagram of a well-known process:



X, Y and Z represent data. A and B represent modules.

What exactly are X, Y, Z, A and B? Explain fully, using both Windows and Unix as your examples.

Question 7. [20]

This is a programming question. Program the following artificial program snippet, written in self-explanatory pseudo code, into JVM.

```
-----  
Z = 0  
if (A = 0 and B = 6) then X := 77 else y := 77  
for (C = 1 to 6) Z = Z + C  
-----
```

Table of JVM instructions

hex	mnemonic	meaning
10	BIPUSH byte	push byte onto stack
59	DUP	copy top word on stack and push onto stack
A7	GOTO offset	unconditional branch
60	IADD	pop two words from stack; push their sum
7E	IAND	pop two words from stack; push Boolean AND
99	IFEQ offset	pop word from stack; branch if it is zero
9B	IFLT offset	pop word from stack; branch if it is less than zero
9F	IF_ICMPEQ offset	pop two words from stack; branch if equal
84	IINC varnum const	add a constant to a local variable
15	ILOAD varnum	push local variable onto stack
B6	INVOKEVIRTUAL disp	invoke a method
80	IOR	pop two words from stack; push Boolean OR
AC	IRETURN	return from method with integer value
36	ISTORE varnum	pop word from stack; store in local variable
64	ISUB	pop two words from stack; push their difference
13	LDC_W index	push constant from constant pool onto stack
00	NOP	do nothing
57	POP	delete word on top of stack
5F	SWAP	swap the top two words on the stack
C4	WIDE	prefix instruction; next instruction has 16-bit index

End of examination paper.