University of Swaziland

Faculty of Science
Department of Computer Science

Supplementary Examination, 2006

Title of Paper: Computer Organisation I

Course Number: CS241

Time Allowed: Three (3) hours

Instruction: Answer all 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*.

Special Requirements:

Calculators are prohibited.

Table of IJVM instructions (appended)

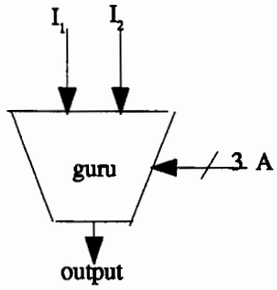
This examination paper should not be opened until permission has been granted by the invigilator.

Question 1.

The following extract, which follows the conventions introduced in the course, is from a provisional data sheet of an experimental ALU.

Data sheet for the Guru ALU

A_1	A_2	A_3	output
0	0	0	eparity
0	0	1	oparity
0	1	0	AND
0	1	1	IOR
1	0	0	NOT(I_1)
1	0	1	XOR
1	1	0	+
1	1	1	-



The functions *eparity* and *oparity* produce 1 if the input has even or odd parity respectively.

What function of I_1 and I_2 appears at the output for the following settings of A and I?

	A_1	A_2	A_3	I_1	I_2
a)	1	0	1	1	0
b)	1	1	1	1	0
c)	0	0	0	0	1
d)	0	0	0	1	1
e)	0	1	0	1	1
f)	1	0	0	1	0
g)	0	1	1	1	0

Question 2.

(a) Express -6_{10} in binary when the computer uses

(i) 2s complement arithmetic with 16 bits

(ii) 1s complement arithmetic with 8 bits

(b) Convert 1212_{16} to decimal.

(c)

Write the following Pascal statement

m := m - n - 1;

in:

i) Java

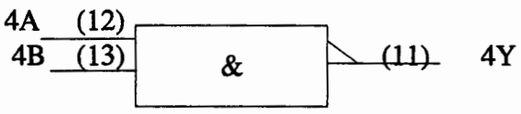
ii) Java assembly language

iii) Java JVM machine code

Question 3.
Java Virtual Machine was designed with tight security in mind. What are the features that deal with security?

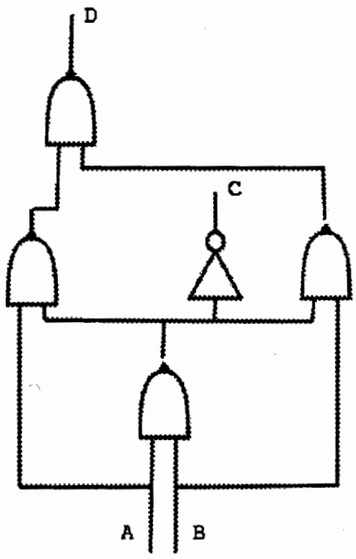
Question 4.
Explain fully, with a diagram, each of the following terms:
a) this computer is little endian
b) pin 5 is asserted low
c) the clock in digital circuits

Question 5.
Part of the logic symbol for a well-known chip is:



Draw the associated part of the package pinout, given that pins 1 and 14 are used for V_{cc} and 0V respectively.

Question 6.
What does the following circuit, of AND and NOT gates, do?



Question 7.
Describe how to use the MIC1 simulator.

Table of IJVM 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