Answers at the end of this document

THE UNIVERSITY OF AUCKLAND

SECOND SEMESTER, 2014
Campus: City

COMPUTER SCIENCE

TEST

Computer Systems 1

(Time Allowed: 45 Minutes)

Notes:

- The use of calculators is NOT permitted.
- Compare the exam version number on the Teleform sheet supplied with the version number above. If they do not match, ask the exam supervisor for a new sheet.
- Enter your name and student ID on the Teleform sheet. Your name should be entered left aligned. If your name is longer than the number of boxes provided, truncate it.
- Answer all **Multiple-choice** questions on the Teleform answer sheet provided. You should attempt all questions.
- Use a dark pencil to mark your answers in the multiple choice answer boxes on the Teleform sheet. Check that the question number on the sheet corresponds to the question number in this question/answer book. If you spoil your sheet, ask the supervisor for a replacement.
- This term test is marked out of 50 marks and is worth 20% of your final mark for this course.
- An appendix is included on the last page. You may detach this appendix.

For each question, choose the best answer according to the information presented in lectures. Select your preferred answer on the Teleform answer sheet by shading in the appropriate box.

Question 1
[2 marks] Who proved that binary arithmetic and Boolean algebra could be performed by simple logic gates?

(a) Alan Turing
(b) Steve Wozniak
(c) Claude Shannon
(d) Vannevar Bush
(e) John von Neumann

Question 2
[2 marks] Which of the following is only an input device?

(a) Monitor
(b) Printer
(c) Disk
(d) Keyboard
(e) None of the above

Question 3
[3 marks] Two values X = 11111111111111111111111010101 and Y = 1111010101are representations of 2's complement integers.

(a) Y is larger
(b) X is larger
(c) X and Y are equal
(d) X is smaller
(e) You cannot tell anything from the information provided

Question 4
[3 marks] What is the 8 bit 2’s complement binary representation of -35

(a) 01011111
(b) 01011101
(c) 11111001
(d) 11011101
(e) 11110101

Question 5
[3 marks] What is the result of adding these unsigned binary numbers: 10110101 + 1011

(a) 11010100
(b) 11000000
(c) 10110000
(d) 01110000
(e) 01010100

Question 6
[3 marks] What is the result of subtracting these unsigned binary numbers: 10110101 + 1011

(a) 11010100
(b) 10110000
(c) 01010100
(d) 10101010
(e) 11000000

Question 7
[3 marks] If 0010100.101 is a binary fractional number what is its decimal equivalent?

(a) 40.125
(b) 40.625
(c) 40.5
(d) 400.6
(e) 4.625

Question 8
[2 marks] For the value of A AND B to be true:

(a) at least one of the two values A, B is true.
(b) neither of the two values A, B is true.
(c) both of the values A, B must be true.
(d) exactly one of the two values A, B is true.
(e) None of the above

Question 9
[3 marks] With 10 bits, we can represent uniquely:

(a) As many distinct items as we wish to
(b) Exactly 1,024 distinct items.
(c) Exactly 100 distinct items
(d) Exactly 10 distinct items
(e) Exactly 2 times 10, or 20 distinct items

Question 10
[3 marks] We say that a set of gates is logically complete if we can build any circuit without using any other kind of gates. Which of the following sets are logically complete?

(a) Set of {AND, OR}
(b) Set of {XOR, OR, NOT}
(c) Set of {XOR, NOT}
(d) Set of {AND, OR, NOT}
(e) None of the above

Question 11
[2 marks] Which of the following digital structures allows you to select a bit from a particular channel?

(a) Gate
(b) Register
(c) Mux
(d) Decoder
(e) None of the above.

Question 12
[2 marks] In the Von Neumann architecture what is the PC in the control unit?

(a) The PC holds the memory address of the next instruction
(b) The PC is the power circuit
(c) The PC is the program clock
(d) The PC is processor circuit providing logic functions
(e) The PC is the program controller deciding what action to perform

Question 13
[2 marks] Who programmed the first compiler?

(a) Steve Wozniak
(b) John von Neumann
(c) Alan Turing
(d) Bill Gates
(e) Grace Hopper

Question 14
[2 marks] In assembly language a semi-colon (;) alone on a line is

(a) a formatting error that has run over from the line above
(b) a way to combine the line above with the line below to form a single instruction
(c) an indication of the start of a new subroutine
(d) a comment to make a program more readable by inserting a blank line
(e) an assembly error, since there is no information present.

Question 15
[3 marks] In LC-3 Assembly Language, the symbol #75 represents

(a) the hex string 75
(b) the decimal value seven point five (7.5)
(c) the decimal value seventy five (75)
(d) the hex string 000100000001
(e) None of the above

Question 16
[3 marks] The LC-3 instruction TRAP x25 causes the PC to be loaded with:

(a) the contents of x0025
(b) x2500
(c) the decimal number 25
(d) x0250
(e) x0025

Question 17
[2 marks] In the LC-3, the clock is stopped by:

(a) the STOP instruction
(b) the END instruction
(c) the clock cannot be stopped
(d) the instruction TRAP x23
(e) the instruction TRAP x25

Question 18
[2 marks] Which instruction in the LC-3 restarts the clock?

(a) TRAP x30
(b) RUN
(c) No instruction can restart the clock.
(d) CLK_ST
(e) RESTART

Question 19
[2 marks] Which instruction performs the exact same function as JMP:

(a) BRnp
(b) BRnz
(c) BRnzp
(d) BRzp
(e) There isn't one

Question 20

[3 marks] What does the following code do:

```
      LEA R1, PROMPT
L1    LDR R0, R1, #0
      BRz FOO          ;where FOO is some other routine
L2    LDI R3, DSR
      BRzp L2
      STI R0, DDR
      ADD R1, R1, #1
      BR L1
DSR    .FILL xFE04
DDR    .FILL xFE06
PROMPT .STRINGZ "Hello World"
```

(a) Displays the string "Hello World"
(b) Waits for the user to enter the string “Hello World” and echoes it back
(c) Prints the string "Hello World" backwards
(d) Goes into an infinite loop until the user enters the string "Hello World"
(e) Branches off to FOO without doing anything

Rough Working – This page will not be marked

APPENDIX

Base Conversion Table and Powers of two

Decimal	Hexadecimal	Binary	2^n Hex	2^n Decimal
0	0	0000	1	1
1	1	0001	2	2
2	2	0010	4	4
3	3	0011	8	8
4	4	0100	10	16
5	5	0101	20	32
6	6	0110	40	64
7	7	0111	80	128
8	8	1000	100	256
9	9	1001	200	512
10	a	1010	400	1024
11	b	1011	800	2048
12	c	1100	1000	4096
13	d	1101	2000	8192
14	e	1110	4000	16384
15	f	1111	8000	32768

Table E.2 The Standard ASCII Table

ASCII			ASCII			ASCII			ASCII		
Character	Dec	Hex	Character	Dec	Hex	Character	Dec	Hex	Character	Dec	Hex
nul	0	00	sp	32	20	@	64	40	`	96	60
soh	1	01	!	33	21	A	65	41	a	97	61
stx	2	02	"	34	22	B	66	42	b	98	62
etx	3	03	#	35	23	C	67	43	c	99	63
eot	4	04	$	36	24	D	68	44	d	100	64
enq	5	05	%	37	25	E	69	45	e	101	65
ack	6	06	&	38	26	F	70	46	f	102	66
bel	7	07	'	39	27	G	71	47	g	103	67
bs	8	08	(	40	28	H	72	48	h	104	68
ht	9	09	)	41	29	I	73	49	i	105	69
lf	10	0A	*	42	2A	J	74	4A	j	106	6A
vt	11	0B	+	43	2B	K	75	4B	k	107	6B
ff	12	0C	'	44	2C	L	76	4C	l	108	6C
cr	13	0D	-	45	2D	M	77	4D	m	109	6D
so	14	0E	.	46	2E	N	78	4E	n	110	6E
si	15	0F	/	47	2F	O	79	4F	o	111	6F
dle	16	10	0	48	30	P	80	50	p	112	70
dc1	17	11	1	49	31	Q	81	51	q	113	71
dc2	18	12	2	50	32	R	82	52	r	114	72
dc3	19	13	3	51	33	S	83	53	s	115	73
dc4	20	14	4	52	34	T	84	54	t	116	74
nak	21	15	5	53	35	U	85	55	u	117	75
syn	22	16	6	54	36	V	86	56	v	118	76
etb	23	17	7	55	37	W	87	57	w	119	77
can	24	18	8	56	38	X	88	58	x	120	78
em	25	19	9	57	39	Y	89	59	y	121	79
sub	26	1A	:	58	3A	Z	90	5A	z	122	7A
esc	27	1B	;	59	3B	[	91	5B	{	123	7B
fs	28	1C	<	60	3C	\	92	5C	|	124	7C
gs	29	1D	=	61	3D	]	93	5D	}	125	7D
rs	30	1E	>	62	3E	^	94	5E	~	126	7E
us	31	1F	?	63	3F	_	95	5F	del	127	7F

CONTINUED

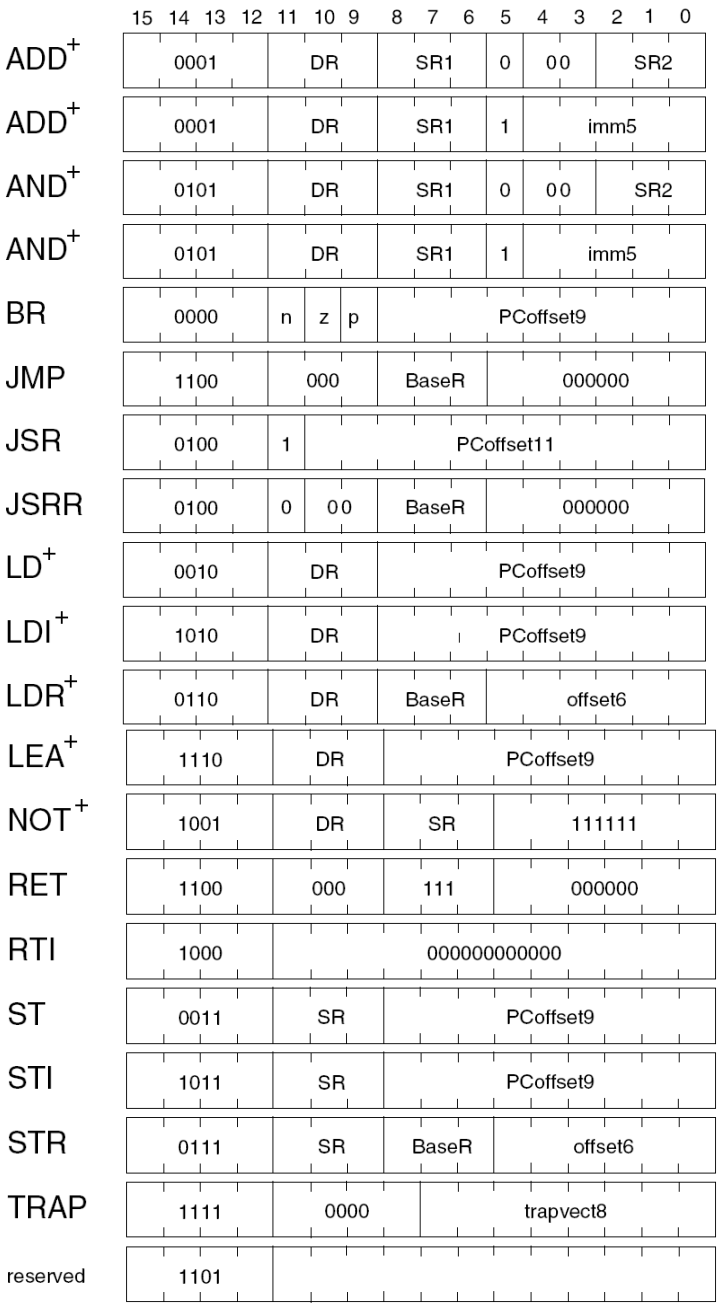

Figure A.2 Format of the entire LC-3 instruction set. **Note:** + indicates instructions that modify condition codes

CompSci.210 Test Semester 2

For every question below the first answer is the correct answer.

[2 marks] Who proved that binary arithmetic and Boolean algebra could be performed by simple logic gates?
Claude Shannon
Alan Turing
John von Neumann
Steve Wozniak
Vannevar Bush

[2 mark] Which of the following is only an input device?
Keyboard
Printer
Monitor
Disk
None of the above

[3 marks] Two values A = 11111111111111111111111010101 and B = 1111010101are representations of 2's complement integers.
A and B are equal
A is smaller
A is larger
B is larger
You cannot tell anything from the information provided

[3 marks] What is the 8 bit 2's complement binary representation of -35
11011101
01011101
11110101
11111001
01011111

[3 marks] What is the result of adding these unsigned binary numbers: 10110101 + 1011
11000000
10110000
01110000
11010100
01010100

[3 marks] What is the result of subtracting these unsigned binary numbers: 10110101 + 1011
10101010
11000000
10110000
11010100
01010100

This question was not marked because of a typo (the 4 in all the answers should have been a 2)
[3 marks] If 0010100.101 is a binary fractional number what is its decimal equivalent?
40.625
40.5
4.625
400.6
40.125

[2 marks] For the value of A AND B to be true:
both of the values A, B must be true.
at least one of the two values A, B is true.
exactly one of the two values A, B is true.
neither of the two values A, B is true.
None of the above

[3 marks] With 10 bits, we can represent uniquely:
Exactly 1,024 distinct items.
Exactly 100 distinct items
Exactly 10 distinct items
Exactly 2 times 10, or 20 distinct items
As many distinct items as we wish to

[3 marks] We say that a set of gates is logically complete if we can build any circuit without using any other kind of gates. Which of the following sets are logically complete?
Set of {AND, OR, NOT}
Set of {AND, OR}
Set of {XOR, NOT}
Set of {XOR, OR, NOT}
None of the above

[2 marks] Which of the following digital structures allows you to select a bit from a particular channel?
Mux
Register
Gate
Decoder

None of the above.

[2 marks] In the Von Neumann architecture what is the PC in the control unit?
The PC holds the memory address of the next instruction
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The PC is processor circuit providing logic functions
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an assembly error, since there is no information present.
a way to combine the line above with the line below to form a single instruction
a formatting error that has run over from the line above
an indication of the start of a new subroutine

[3 marks] In LC-3 Assembly Language, the symbol #75 represents
the decimal value seventy five (75)
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the hex string 75
the hex string 000100000001
None of the above

[3 marks] The LC-3 instruction TRAP x25 causes the PC to be loaded with:
the contents of x0025
x0025
x2500
x0250
the decimal number 25

[2 marks] In the LC-3, the clock is stopped by:
the instruction TRAP x25
the STOP instruction

the instruction TRAP x23
the END instruction
the clock cannot be stopped

[2 marks] Which instruction in the LC-3 restarts the clock?
No instruction can restart the clock.
TRAP x30
RESTART
CLK_ST
RUN

[2 marks] Which instruction performs the exact same function as JMP:
There isn't one
BRnz
BRnp
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[3 marks] What does the following code do:

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      BR L1
DSR    .FILL xFE04
DDR    .FILL xFE06
PROMPT .STRINGZ "Hello World"
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Displays the string "Hello World"
Goes into an infinite loop until the user enters the string "Hello World"
Branches off to FOO without doing anything
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