ONLINE QUIZ
AY2019/2020 Semester 2
CS2100 — COMPUTER ORGANISATION
11 March 2020
ANSWER SHEET

Total mark: /40

Question 0: Personal Particulars ***[1 mark]***

Student Number	**Tutorial Grp**
A	

Question 1: Warmup Questions ***[8 marks]***

a) `ADD $1, $2, $2, 0` [2 marks]

b) `XOR $1, $2, $7, 0` (can swap $2 and $7)
or
`SUB $1, $0, $2, 1` (by property of 2s complement) [2 marks]

c) `ADD $1, $2, $3, -3` [2 marks]

d) `ADD $1, $2, $0, -2`
or
`SUB $1, $2, $0, 2` [2 marks]

Question 2: Compilation ***[8 marks]***

```
        ADD $1, $0, $0, 0    # sum = 0
        ADD $2, $0, $0, 0    # i = 0
loop:   BEQ $1, $0, cont     # while (sum == 0) continue
        BEQ $0, $0, end      # otherwise, end

cont:   ADD $4, $2, $2, 0    # array element is 2 bytes, so 2i
        ADD $4, $4, $3, 0    #   $4 = addr of x[i]
        LW  $5, $4, 0        #   $5 = x[i]
        BEQ $5, $0, case0    # switch(x[i]) --> case  0:
        BEQ $5, $7, add      # switch(x[i]) --> case -1: (add)
        ADD $1, $5, $2, 5    # default: sum = x[i] + i + 5
        BEQ $0, $0, add      # unconditional branch to add
case0:  SW  $7, $4, 0        # x[i] = -1
add:    ADD $2, $2, $0, 1    # i = i + 1

break:  BEQ $0, $0, loop     # goto loop
end:
```

Question 3: Encoding ***[14 marks]***

a)

Hexadecimal	SIMP	
0x402F	`SUB $2, $0, $0, -1`	[2 marks]
0x2920	`L: ADD $2, $2, $2, 0`	[2 marks]
0x241F	`ADD $1, $1, $0, -1`	[2 marks]
0xE08A	`BEQ $0, $1, E`	[2 marks]
0xE482	`BEQ $1, $1, L`	[2 marks]
	`E:`	

b) (i) **15 (7+8)** [2 marks] (ii) **8 (7+1)** [2 marks]

Question 4: Datapath and Control ***[9 marks]***

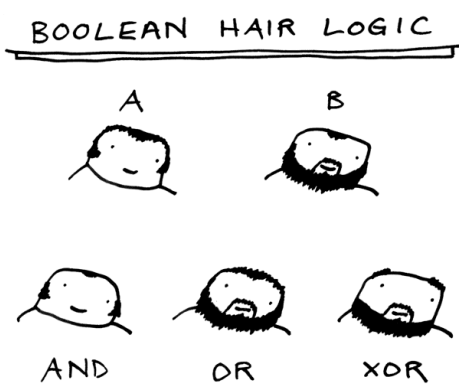
a) **sign extend** [1 mark]

b) **0x0000** *(since LW/SW need to do $rs + 0 + const, which is OP1 + 0 + OP2)* [1 mark]

c) [7 marks]

RR1	RR2	WR	OP1	OP2	OP3	addr	MWD
$4	$5	$3	R[$4]	R[$5]	0	R[$4] - R[$5] - 0 or R[$4] - R[$5]	R[$5]

Feedback: *this will not affect your marks in any way*



Do you have any comment/feedback about the module?