CS2100 Computer Organisation
AY2021/22 Semester 1
Assignment 2 Answer Sheet

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TUTORIAL GROUP:	**T02**

Question 0. Submission instructions (3 marks)

a. Name your file with your student number (eg: AxxxxxxxY>.pdf). (1 mark)	**Y**
b. Submit your assignment as a single PDF file. (1 mark)	**Y**
c. Your submission has your tutorial group number, student number and name. (1 mark)	**Y**

Question 1. Datapath (8 marks)

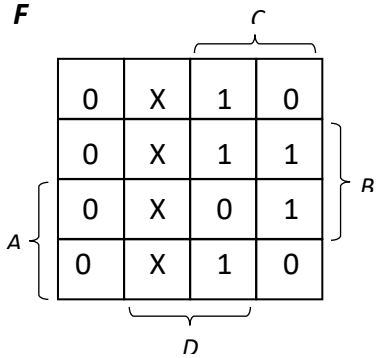
Field	Value
RegDst	X
MemRead	0
MemWrite	1
ALUSrc	1
RegWrite	0
Instruction[31-26] *	0b 101011
Instruction[25-21] *	0b 11101
Instruction[20-16] *	0b 10010
Instruction[15-11] *	0b 11111
Instruction[5-0] *	0b 11000
❶ * (output from sign-extend)	0x FFFF FFD8
❷ *	0x 0000 0000
❸ *	0x 0000 00A4
❹ * (read data 2)	0x 0004 0200
❺ *	0x 7FFF F01E
❻ (ALU control output)	0010

Question 2. Simplification (14 marks)

(a) $B \cdot Y \cdot E' \cdot (A' \cdot X + A \cdot X' + A \cdot X + A' \cdot X') + B' \cdot L \cdot U \cdot E' \cdot S' \cdot K \cdot Y + Y \cdot E' \cdot S'$ [6 marks]

B·Y·E'· (1) + B'·L·U·E'·S'·K·Y + Y·E'·S'	Complement Law
B·Y·E' + B'·L·U·E'·S'·K·Y + Y·E'·S'	One Element Law
B·Y·E' + Y·E'·S'·(B'·L·U·K + 1)	Distributive Law
B·Y·E' + Y·E'·S'	One Element Law
Y·E'·(B + S')	Distributive Law

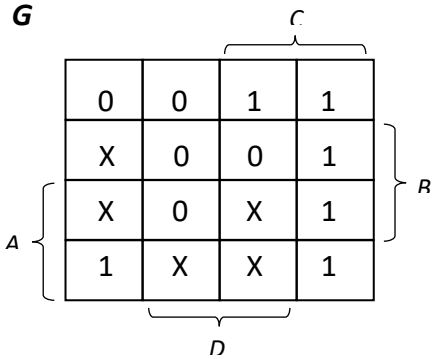
(b)



[4 marks]

#PIs	4
#EPIs	3
Simplest SOP	B·C·D' + A'·D + B'·D
Simplest POS	C·(B+D')·(A'+B'+D')

(c)

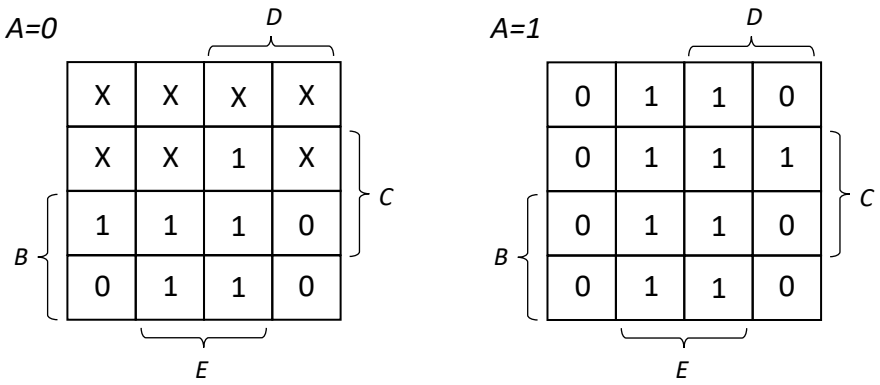


[4 marks]

#PIs	6
#EPIs	3
Simplest SOP	A·B' + B'·C + C·D'
Simplest POS	(A+C)·(B'+D')

Question 3. Circuit Design (8 marks)

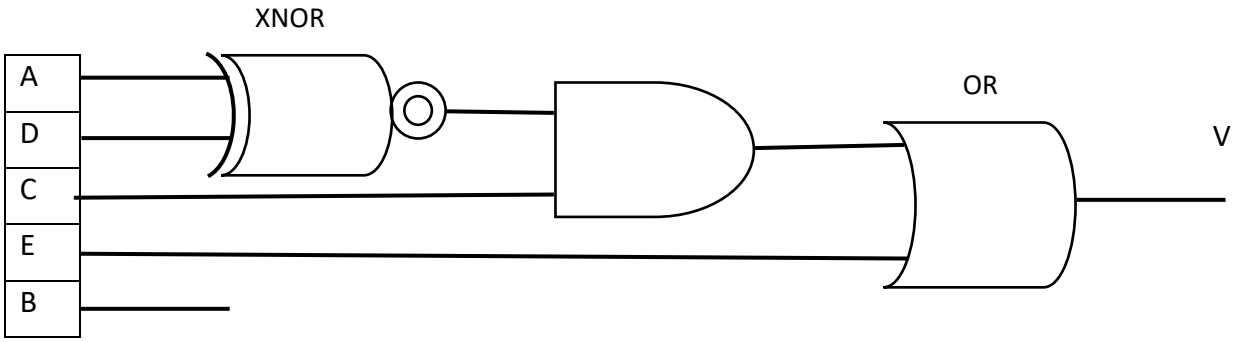
(a) [2 marks]



(b) Write out the simplified SOP expression for *M*. [3 marks]

E + A'·C·D' + A·C·D

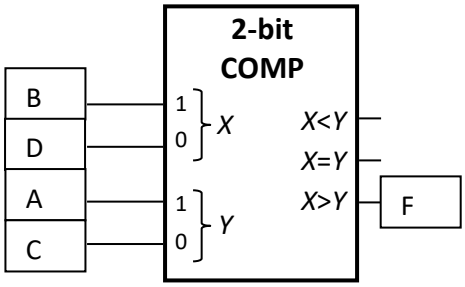
c) Draw the circuit for *V*. [3 marks]



*Labelling xnor and or in case drawing is too bad ._.

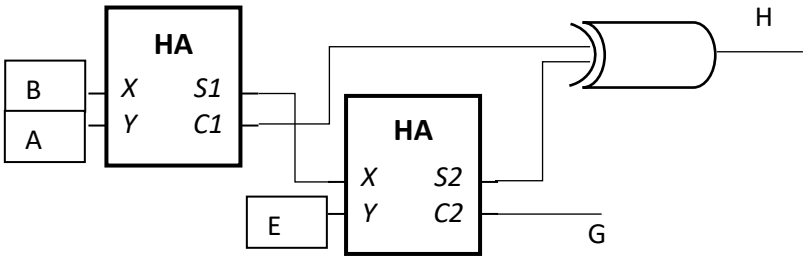
Question 4. Block-level design (7 marks)

(a) $F(A,B,C,D) = \Sigma m(1, 4, 5, 6, 7, 13)$ [3 marks]



(b) $G(A,B,E) = \Sigma m(3,5)$

$H(A,B,E) = \Sigma m(1,2,4,6)$ [4 marks]



A	B	E	G	H	C1	S1	C2 = S1·E = G	S2 = A⊕B⊕E	H = A⊕B⊕E⊕C1
0	0	0	0	0	0	0	0	0	0
0	0	1	0	1	0	0	0	1	1
0	1	0	0	1	0	1	0	1	1
0	1	1	1	0	0	1	1	0	0
1	0	0	0	1	0	1	0	1	1
1	0	1	1	0	0	1	1	0	0
1	1	0	0	1	1	0	0	0	1
1	1	1	0	0	1	0	0	1	0

(Add more columns to the table if there are insufficient columns.)