

NATIONAL UNIVERSITY OF SINGAPORE

CS2100 – COMPUTER ORGANISATION

(Semester 2: AY2024/25)

Final Assessment Answer Sheets

Time Allowed: 2 Hours

**PLEASE READ THE INSTRUCTIONS IN THE
QUESTION PAPER CAREFULLY BEFORE PROCEEDING**

Please write and shade your Student Number correctly on the box on the right with a pencil.

For Examiner's Use Only

Question	Marks
PART A: MCQs	/36
PART B: Q19	/12
PART B: Q20	/14
PART B: Q21	/13
PART B: Q22	/12
PART B: Q23	/13
TOTAL	/100

STUDENT NUMBER									
A									
U	☐	0	0	0	0	0	0	0	A N
A	☒	1	1	1	1	1	1	1	B R
HT	☐	2	2	2	2	2	2	2	E U
NT	☐	3	3	3	3	3	3	3	H W
		4	4	4	4	4	4	4	J X
		5	5	5	5	5	5	5	L Y
		6	6	6	6	6	6	6	M
		7	7	7	7	7	7	7	
		8	8	8	8	8	8	8	
		9	9	9	9	9	9	9	

Part A: Multiple Choice Questions (Total: 36 marks)

Please shade using **pencil** only ONE bubble for each question.

Q	(A)	(B)	(C)	(D)	(E)
1.	☐	☐	☐	☐	☐
2.	☐	☐	☐	☐	☐
3.	☐	☐	☐	☐	☐
4.	☐	☐	☐	☐	☐
5.	☐	☐	☐	☐	☐
6.	☐	☐	☐	☐	☐
	(A)	(B)	(C)	(D)	(E)

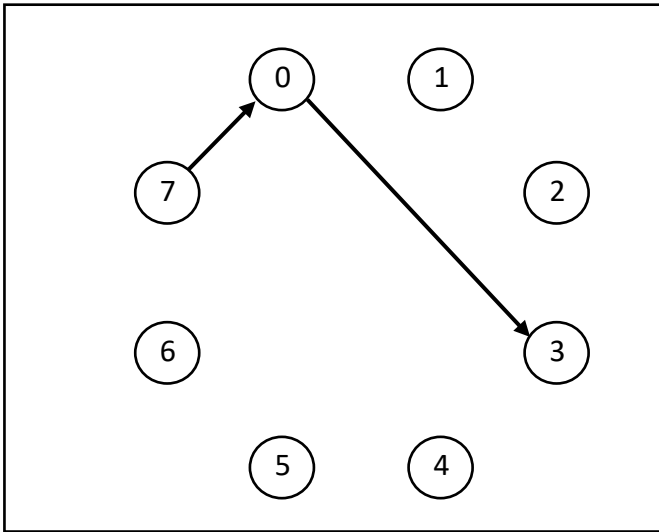
Q	(A)	(B)	(C)	(D)	(E)
7.	☐	☐	☐	☐	☐
8.	☐	☐	☐	☐	☐
9.	☐	☐	☐	☐	☐
10.	☐	☐	☐	☐	☐
11.	☐	☐	☐	☐	☐
12.	☐	☐	☐	☐	☐
	(A)	(B)	(C)	(D)	(E)

Q	(A)	(B)	(C)	(D)	(E)
13.	☐	☐	☐	☐	☐
14.	☐	☐	☐	☐	☐
15.	☐	☐	☐	☐	☐
16.	☐	☐	☐	☐	☐
17.	☐	☐	☐	☐	☐
18.	☐	☐	☐	☐	☐
	(A)	(B)	(C)	(D)	(E)

Part B (Total: 64 marks) Write your answers within the boxes provided.

19. Sequential circuit [12 marks]

(a)
[6]



(b) Sink states.

[1]

(c)
[4]

TB =

TC =

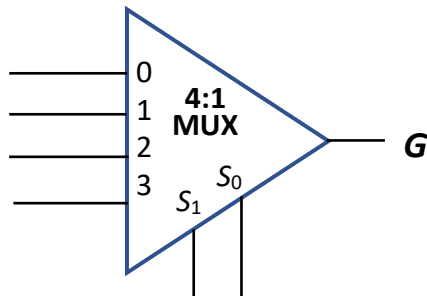
(d)
[1]

20. Combinational circuits [14 marks]

(a)
[4]

F =

(b)
[4]



(c)
[6]

ALUcontrol2 =

ALUcontrol1 =

ALUcontrol0 =

21. MIPS [13 marks]

(a) Contents of array *B* after the execution of the code:

[2]

(b) Write an equivalent C code using a for loop:

[3]

(c) Total number of instructions executed:

[2]

(d) Encoding of `lw $s1, 0($t1)` in hexadecimal:

[2]

(e) Encoding of `bne $s3, $0, skip` in hexadecimal:

[2]

(f) Encoding of `j loop` in hexadecimal:

[2]

22. Pipelining [12 marks]

- (a) [1]
- (b) [3]
- (c) [3]
- (d) [3]
- (e) [2]
-

23. Cache [13 marks]

Direct-mapped data cache:

- (a) Byte-offset [1]
- (b) Index [1]
- (c) #hits [3]

2-way set-associative data cache:

- (d) Set-index [1]
- (e) #hits [3]

Direct-mapped instruction cache:

- (f) Index [1]
- (g) #hits [3]

=== END OF PAPER ===