NATIONAL UNIVERSITY OF SINGAPORE

# CS2100 – COMPUTER ORGANISATION

(Semester 2: AY2021/22)

## ANSWER SHEETS

Time Allowed: 2 Hours

## INSTRUCTIONS

1. These ANSWER SHEETS consist of **FIVE (5)** printed pages.

2. Answer **ALL** questions on these Answer Sheets. You are to submit only these Answer Sheets and not the question paper. You may write in pen or pencil.

3. Printed/written materials are allowed. Apart from calculators, electronic devices are not allowed.

4. The maximum mark of this assessment is 100.

5. Do <u>not</u> write your name. Write your Student Number (eg: A0123456X) below.

| A | 0 |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|

For internal use only

| MCQs (12) | MRQs (18) | Q13 (12) | Q14 (16) | Q15 (13) | Q16 (13) | Q17 (16) | Total (100 marks) |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |

**=== END OF INSTRUCTIONS ===**

Write your answers for MCQs and MRQs in the boxes below, in **CAPITAL LETTERS**:

**1** ☐   **2** ☐   **3** ☐   **4** ☐   **5** ☐   **6** ☐

**7** ☐   **8** ☐   **9** ☐   **10** ☐   **11** ☐   **12** ☐

**Q13. Sequential circuits [12 marks]**

(a) [5]
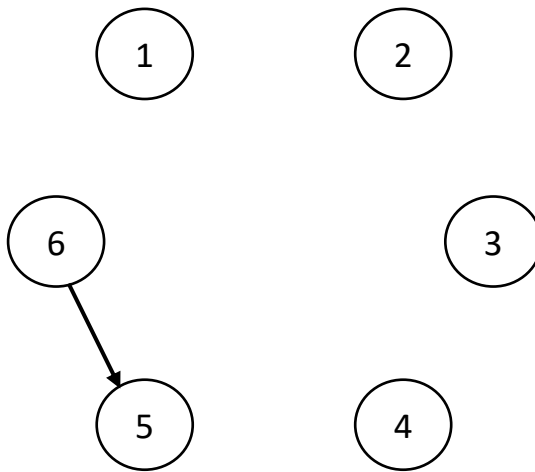


(b) [1]

(c) [6]

$TA =$

$TB =$

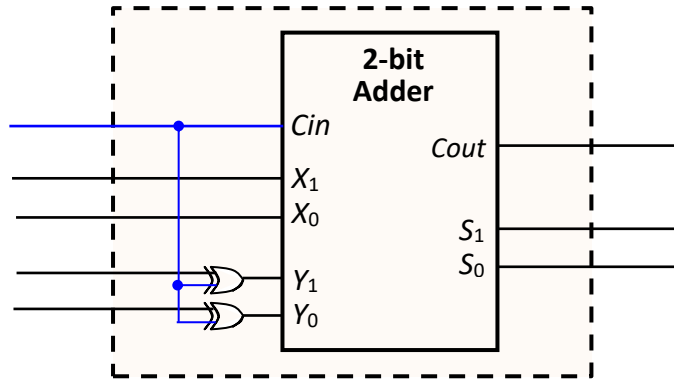$TC =$

Total:          / 12

**Q14. Combinational circuits [16 marks]**

(a) [4]

$F(A,B,C,D) = \Sigma m$

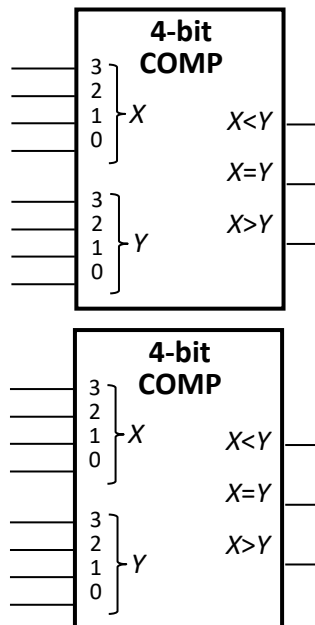(b) [4]



(c) [8]

  (i) [2]

Number of PIs =

Number of EPIs =

  (ii) [2]

Simplified SOP expression for $G$.

$G =$

  (iii) [4]



Total:       / 16

**Q15. MIPS [13 marks]**

(a)
[2]

> **Array *B* =**

(b)
[4]

(c)
[2]

(d)
[2]

(e)
[3]

```
        add  $t9, $s1, $0   # I11

        add  $s1, $s2, $0   # I12

        add  $s2, $t9, $0   # I13

 skip:  sw   $s1, 0($t1)    # I14

        sw   $s2, 0($t2)    # I15

        addi $t0, $t0, 4    # I16
```

Total:          / 13

**Q16. Pipelining [13 marks]**

(a)
[2]

(b)
[3]

(c)
[3]

(d)
[3]

(e)
[2]

Total: / 13

_____

**Q17. Cache [16 marks]**

(a)

(i) [2]   Set index: _____ ;          Byte offset: _____

(ii) [2]   Number of misses: _____

(b)
[2]   Number of misses: _____

(c)
[2]    Index: _____ ;          Byte offset: _____

(d)
[4]   Hits for array *A* = _____          ; Hits for array *B* = _____

(e)
[4]   Hits for array *A* = _____          ; Hits for array *B* = _____

Total: / 16

**=== END OF ANSWER SHEETS ===**