BRAC University
Department of Computer Science and Engineering

Final Exam
Full Marks: **15 x 3 = 45**
Time: **1 hour 30 minutes**
Date: **7th May, 2024**

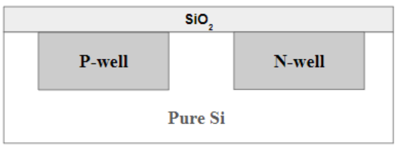
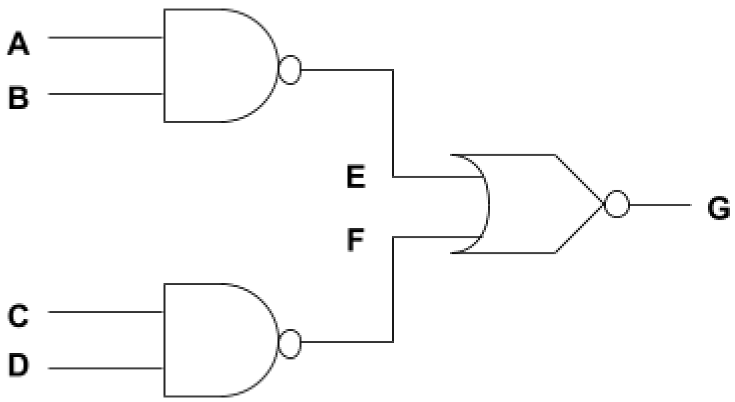
Semester: **Spring 2024**
Course Code: **CSE460**
Course Title: **VLSI Design**

Set A

Student ID:	Name:	Section:

[Answer all questions. Each question carries equal marks.]

[After the exam, *the question paper should be turned in along with the answer script.*]

1. (CO3)	(i)	Consider the following logic function: **Y = (A+B) . (C+D). (E.F)**		
		(a)	**Draw** the stick diagram.	**7**
		(b)	**Estimate** the total layout area.	**3**
	(ii)	(a)	Briefly **explain** why Lithography is used in CMOS fabrication.	**3**
		(b)	**Draw** the required masks to fabricate the following. 	**2**
2. (CO1)	Consider the following circuit:  The switching probabilities of nodes **A**, **B**, **C**, **D** and basic logic gates along with the node capacitances of **E**, **F**, **G** are given below:			

Node	Switching probability
A	0.4
B	0.7
C	0.8
D	0.5

Gate	Switching probability
AND	P_1P_2
OR	$1-(1-P_1)(1-P_2)$
NOT	$1-P$

Node	Capacitance (nF)
E	4
F	6
G	5

Explanation of the second table: Say, an AND gate has two input nodes with switching probabilities of P_1 and P_2. The switching probability of the output node will be P_1*P_2.

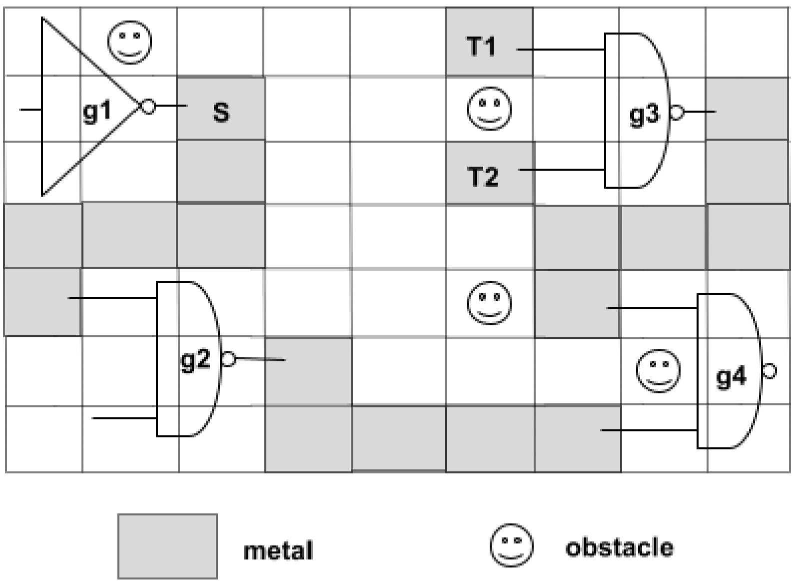
Now, if $\mathbf{P_i}$ is the switching probability of any node **i**, the activity factor of that node can be calculated using the following equation:

$$\alpha_i = P_i(1-P_i)$$

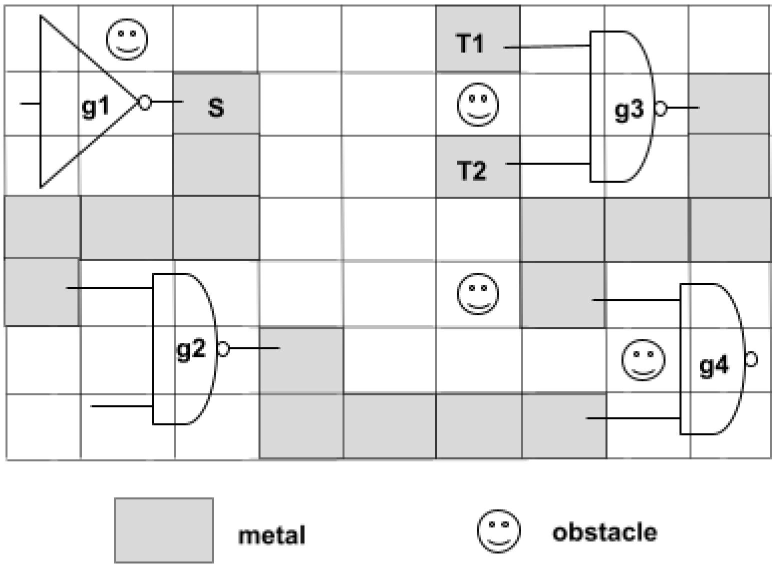
For the nodes **E**, **F** and **G**:

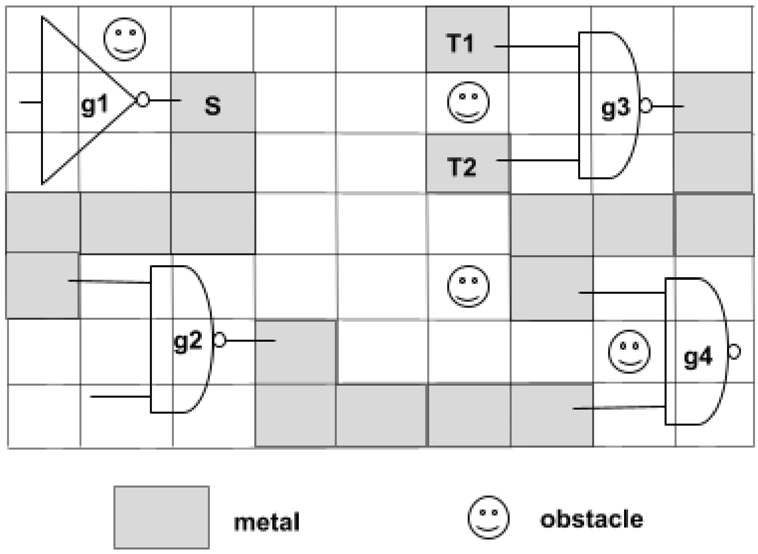
(a)	**Calculate** the switching probabilities.	6
(b)	**Determine** the activity factors.	3
(c)	**Calculate** the switching power losses.	6

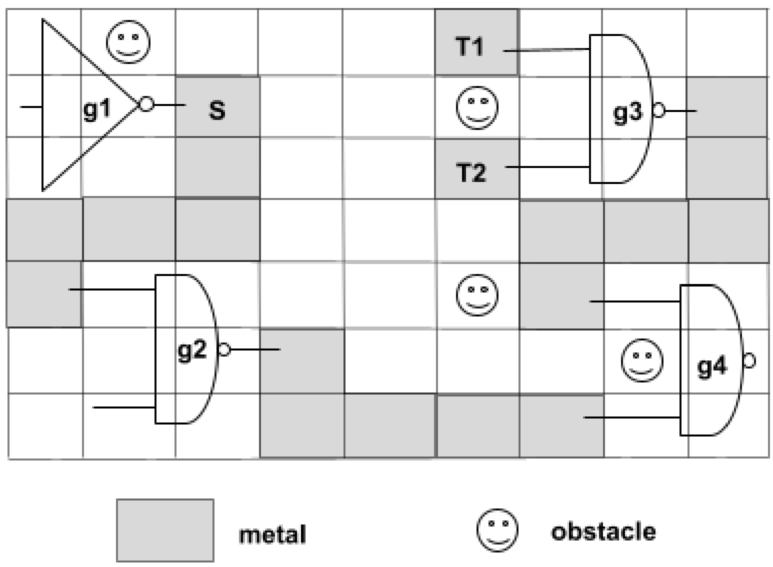
3. (CO4) In the following figure, you can see the grids for Lee's Maze Algorithm.



(a)	Using the algorithm, **find** the <u>shortest</u> path from S to T1 and T2 allowing minimum bends. **Answer this question on the next page of the question paper.**	6
(b)	**Show** the graph representation of the connected gates ignoring the grids. (Convert gates to nodes).	3
(c)	**Compare** the initial cut cost with that of after the first iteration of the KL algorithm for partitioning. Assume initial Cut Sets: A (g1,g2) and B (g3,g4).	6


T1
g1
S
g3
T2
g2
g4
metal
obstacle


T1
g1
S
g3
T2
g2
g4
metal
obstacle


T1
g1
S
g3
T2
g2
g4
metal
obstacle