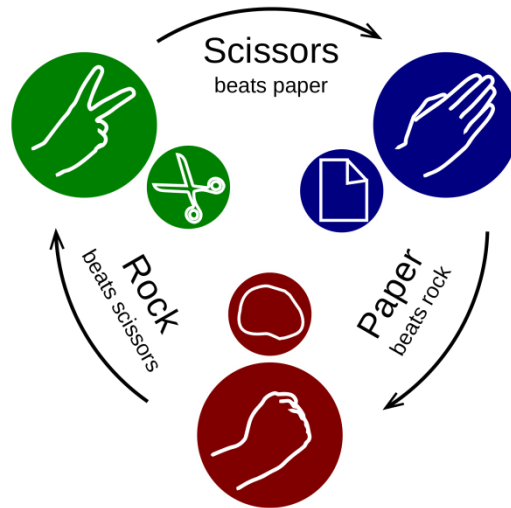


**Department of Computer Science and Engineering**  
**BRAC University**  
**FINAL EXAMINATION SPRING 2016**

**Question No. 6 : Rock Scissors Game**

**Rock-paper-scissors** is a game usually played between two people, in which each player simultaneously forms one of three shapes with an outstretched hand. These shapes are "rock" (a simple fist), "paper" (a flat hand), and "scissors" (a fist with the index and middle fingers together forming a V). The game has only three possible outcomes other than a tie: a player who decides to play rock will beat another player who has chosen scissors ("rock crushes scissors") but will lose to one who has played paper ("paper covers rock"); a play of paper will lose to a play of scissors ("scissors cut paper").

This time we have decided to slightly modify the game with only two options, Rock and Scissor.

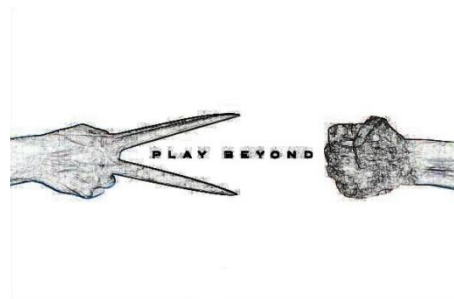


**Input (4 variables)**

**$R1 = 1$**  indicates Player 1 has chosen **Rock**.  
 **$S1 = 0$**  indicates Player 1 has not chosen **Scissor**.  
 **$R2 = 0$**  indicates Player 2 has not chosen **Rock**.  
 **$S2 = 1$**  indicates Player 2 has chosen **Scissor**.

**Output (3 variables)**

**$P1 = 1$**  indicates **Player 1 is winner**  
 **$P2 = 1$**  indicates **Player 2 is winner**  
 **$D = 1$**  indicates **there is a tie**



We have to consider the following points when designing the game:

- i) If player 1 or player 2 has not chosen anything, there will be **no winner nor tie**.
- ii) A player cannot choose rock and scissor both at a time. This state can be considered as **DON'T CARE**.

- a) Using the above specification, prepare a truth table for the game. [15 marks]
- b) Using 4 variable Karnaugh-Map method, derive SOP expressions for all of the three possible results. [15 marks]

R1	S1	R2	S2	P1	P2	D	
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	0	0	0	0	2
0	0	1	1	x	x	x	3
0	1	0	0	0	0	0	4
0	1	0	1	0	0	1	5
0	1	1	0	0	1	0	6
0	1	1	1	x	x	x	7
1	0	0	0	0	0	0	8
1	0	0	1	1	0	0	9
1	0	1	0	0	0	1	10
1	0	1	1	x	x	x	11
1	1	0	0	x	x	x	12
1	1	0	1	x	x	x	13
1	1	1	0	x	x	x	14
1	1	1	1	x	x	x	15

	R2!	R2!	R2	R2	
R1!			x		S1!
R1!			x		S1
R1	x	x	x	x	S1
R1		1	x		S1!
	S2!	S2	S2	S2!	

$P1 = R1S2$

	R2!	R2!	R2	R2	
R1!			x		S1!
R1!			x	1	S1
R1	x	x	x	x	S1
R1			x		S1!
	S2!	S2	S2	S2!	

$P2 = R2S1$

	R2!	R2!	R2	R2	
R1!			x		S1!
R1!		1	x		S1
R1	x	x	x	x	S1
R1			x	1	S1!
	S2!	S2	S2	S2!	

$D = S1S2 + R1R2$