

19CSE205 – Program Reasoning – Assignment – 4

1. Deduce the weakest preconditions for the following programs. **Show the step by step working of deduction to get full marks.** You need to work the problems out with pen and paper, scan and submit.

- a. Increment a number

P	
S	$a = a + 1$
Q	$a < 0 \vee a > 0$

- b. Absolute value

P	
S	$\text{if } (x < 0)$ $\quad \text{abs} = -1 * x;$ else $\quad \text{abs} = x;$
Q	$\text{abs} \geq 0$

- c. Swapping two integers

P	
S	$a = a + b$ $b = a - b$ $a = a - b$
Q	$a == 10 \wedge b == 20$

d. Operations on a stack.

P	
S	Push element to stack; size = size + 1; Push element to stack; size = size + 1; Pop the topmost element; size = size - 1; Pop the topmost element; size = size - 1; Push element to stack; size = size + 1; Pop the topmost element; size = size - 1; Pop the topmost element; size = size - 1;
Q	size >= 0

2. Fill the following truth table to show that $B \Rightarrow S1 \wedge !B \Rightarrow S2$ is equivalent to $(B \wedge S1) \vee (!B \wedge S2)$.

B	S1	S2	$B \Rightarrow S1$!B	$!B \Rightarrow S2$	$B \Rightarrow S1 \wedge !B \Rightarrow S2$
T	T	T				
T	T	F				
T	F	T				
T	F	F				
F	T	T				
F	T	F				
F	F	T				
F	F	F				

B	S1	S2	$B \wedge S1$!B	$!B \wedge S2$	$B \wedge S1 \vee !B \wedge S2$
T	T	T				
T	T	F				
T	F	T				
T	F	F				
F	T	T				
F	T	F				
F	F	T				
F	F	F				