1 Maximum $st$-Flow and Minimum $st$-Cut

You are asked to prove two Lemmas from lecture ‘Pseudo Boolean Optimization II’ that are central to proving the Max $st$-Flow/Min $st$-Cut Theorem. Formulations of the two lemmas as well as the corresponding notation can be found in lecture slides.

1.1 Prove Lemma 5.
Points: 13

1.2 Prove Lemma 7.
Points: 5

1.3 Lemma 7 - Discussion
Points: 2
Does Lemma 7 also hold for an $st$-preflow instead of an $st$-flow? Why?