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**Problem 0**

<b>Points:</b>
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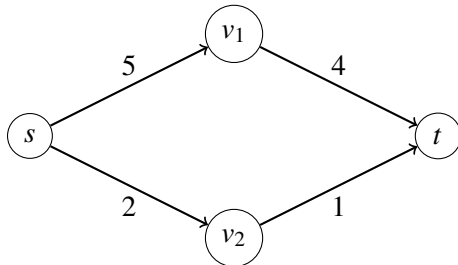
**Acknowledgements**

- (a) I did not work in a group.
- (b) I did not consult without anyone my group members.
- (c) I did not consult any non-class materials.

**Problem 1****Points:**

The given statement is **False**. If  $f$  is a maximum  $s - t$  flow in  $G$ , then  $f$  need not to saturate every edge out of  $s$  with flow.

Counter Example:



Here, the maximum flow on the upper branch will be 4 since the bottleneck capacity for the path  $s \Rightarrow v_1 \Rightarrow t$  is 4. The maximum flow on the lower branch will be 1 since the bottleneck capacity for the path  $s \Rightarrow v_2 \Rightarrow t$  is 1.

Clearly, both the edges out of  $s$  have flow value  $f(e) < c_e$  where  $c_e$  is the capacity of the edges coming out of node  $s$ . Therefore,

$$v(f) = \sum_{e \text{ out of } s} f(e) < \sum_{e \text{ out of } s} c_e = C$$

So,  $f$

**Problem 2**

<b>Points:</b>
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**Problem 3**

<b>Points:</b>
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