22 SPRING CSCE 629 600: ANALYSIS OF ALGORITHMS - Homework 12

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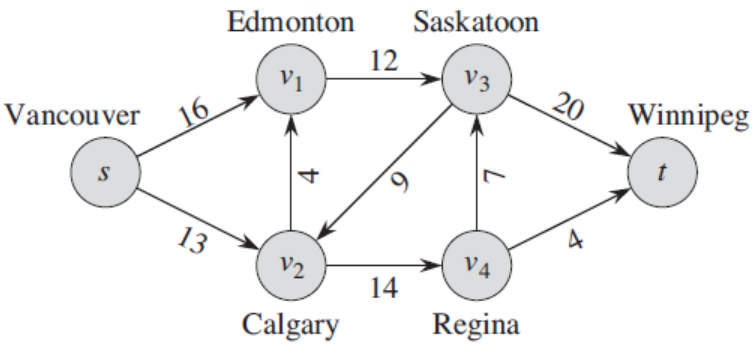
Question (1) ***Textbook page 730, Exercise 26.2-3.***

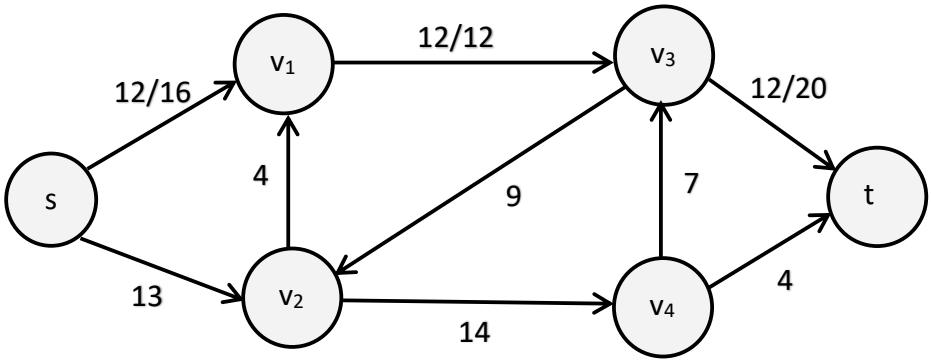
Show the execution of the Edmonds-Karp algorithm on the flow network of Figure 26.1(a).

ANSWER:

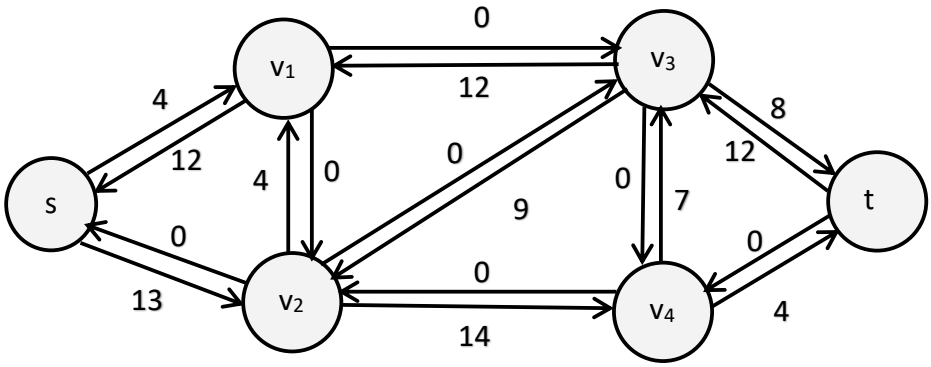
Figure 26.1(a) is as shown in the below image:



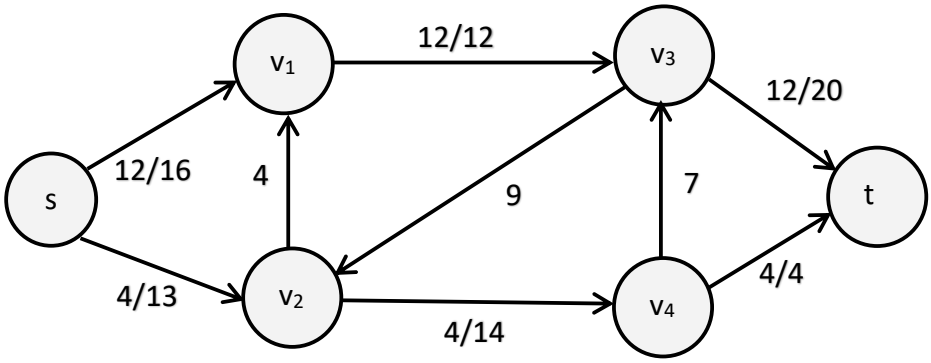
We now perform a BFS in order to select a path from s to t, where we will be taking into account the neighbors of the vertices as they are appearing in the following ordering {s,v_1, v_2, v_3, v_4, t}, then we will be getting a path **s,v_1, v_3, t**. The minimum capacity of this path is: min(12, 16, 20) = 12. So we will send a flow of 12 units along this path.



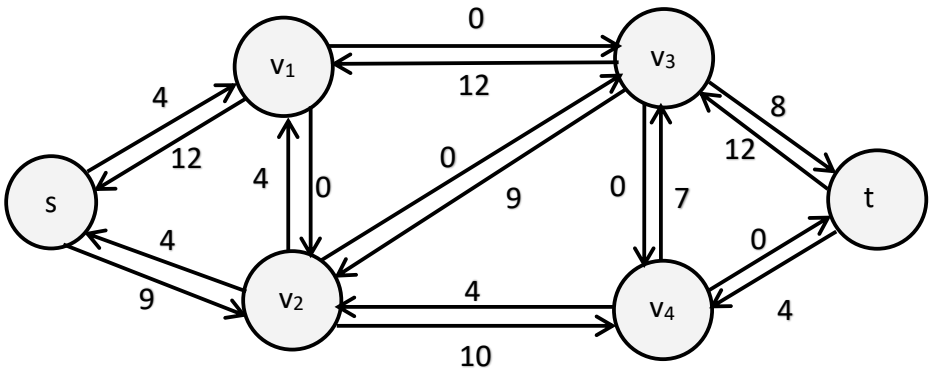
The residual network then will be:



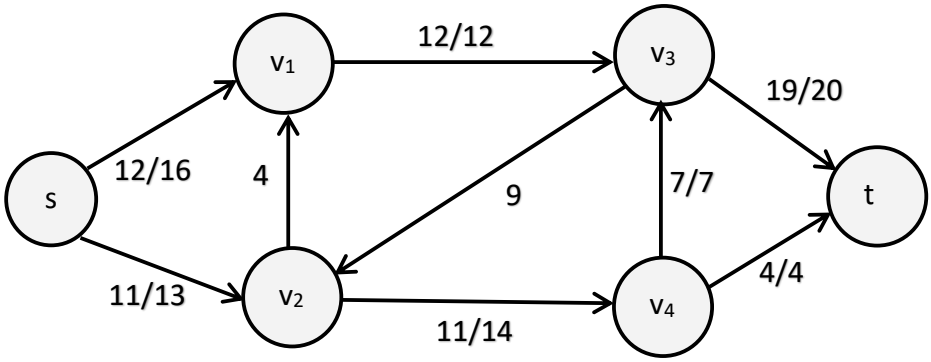
We will now perform BFS again on this resulting residual network shown above. On doing that we will get the path **s,v_2, v_4, t.** The minimum capacity of this path is: min(13, 14, 4) = 4. So we will send a flow of 4 units along this path.



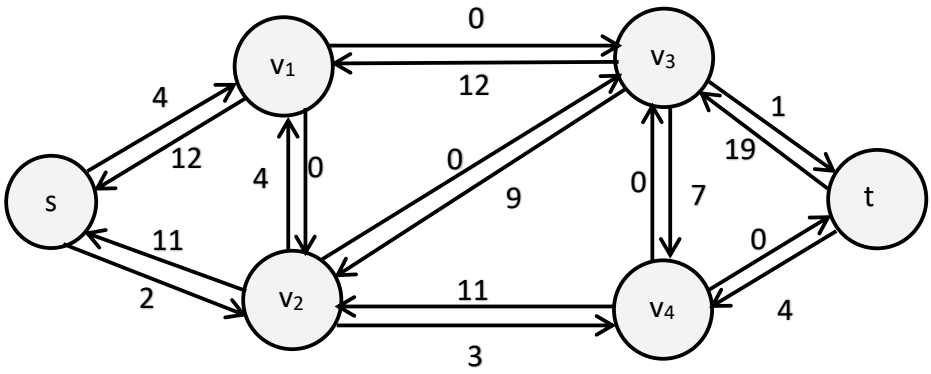
The residual network then will be:



Now, we will see that the only remaining path in the above residual network is **s,v_2, v_4, v_3, t** that we get using BFS. The minimum capacity of this path is: min(9, 10, 7, 8) = 7. So we will send a flow of 7 units along this path.



The residual network then will be:



Now, there is no other path left through which we can send flow (i.e., a path with a residual capacity > 0) from s to t. **Adding together all the flows calculated above, we get the total maximum flow as: 19+4 = 11 + 12 = 23 (ANSWER)**