**CS5222 Assignment 2 (Sem A, 2024-25)**

Chapter 3

P22. Consider the GBN protocol with a sender window size of 4 and a sequence number range of 1,024. Suppose that at time $t$, the next in-order packet that the receiver is expecting has a sequence number of $k$. Assume that the medium does not reorder messages. Answer the following questions:

    a. What are the possible sets of sequence numbers inside the sender's window at time $t$? Justify your answer.

    b. What are all possible values of the ACK field in all possible messages currently propagating back to the sender at time $t$? Justify your answer.

Chapter 4 & 5

P4. Consider the network below.

    a. Suppose that this network is a datagram network. Show the forwarding table in router A, such that all traffic destined to host H3 is forwarded through interface 3.

    b. Suppose that this network is a datagram network. Can you write down a forwarding table in router A, such that all traffic from H1 destined to host H3 is forwarded through interface 3, while all traffic from H2 destined to host H3 is forwarded through interface 4? (Hint: this is a trick question.)
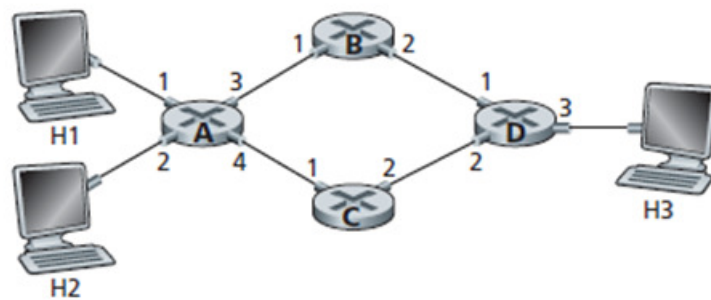
P19. Consider the SDN OpenFlow network shown in **Figure 4.30** . Suppose that the desired forwarding behavior for datagrams arriving at s2 is as follows:

- any datagrams arriving on input port 1 from hosts h5 or h6 that are destined to hosts h1 or h2 should be forwarded over output port 2;

- any datagrams arriving on input port 2 from hosts h1 or h2 that are destined to hosts h5 or h6 should be forwarded over output port 1;

- any arriving datagrams on input ports 1 or 2 and destined to hosts h3 or h4 should be delivered to the host specified;

- hosts h3 and h4 should be able to send datagrams to each other.

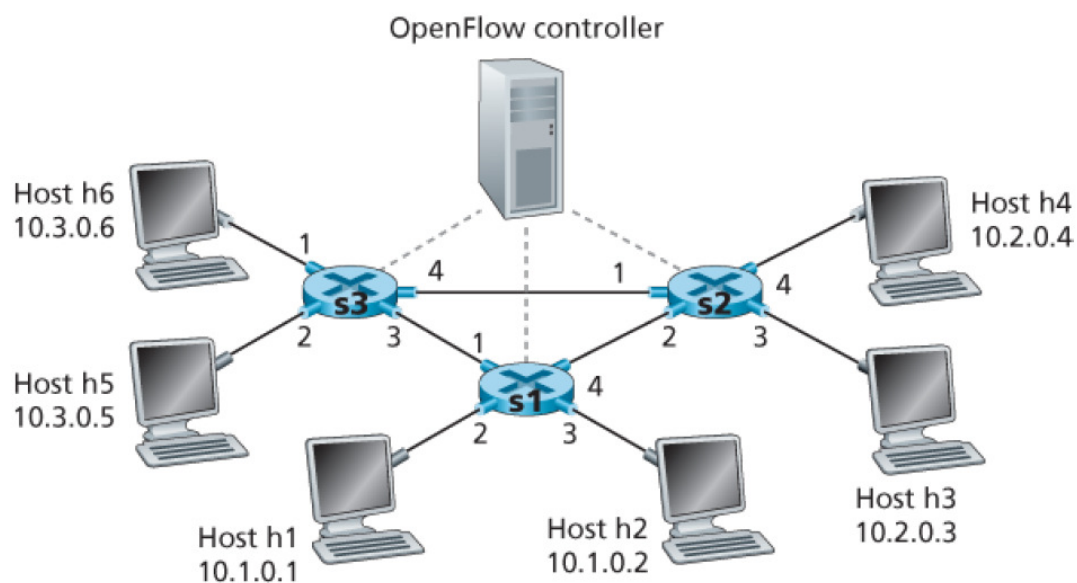Specify the flow table entries in s2 that implement this forwarding behavior.



*Figure 4.30 OpenFlow match-plus-action network with three packet switches, 6 hosts, and an OpenFlow controller*

P20. Consider again the SDN OpenFlow network shown in **Figure 4.30** . Suppose that the desired forwarding behavior for datagrams arriving from hosts h3 or h4 at s2 is as follows:

- any datagrams arriving from host h3 and destined for h1, h2, h5 or h6 should be forwarded in a clockwise direction in the network;
- any datagrams arriving from host h4 and destined for h1, h2, h5 or h6 should be forwarded in a counter-clockwise direction in the network.

Specify the flow table entries in s2 that implement this forwarding behavior.

**Paper reading**

Please read the paper "S. Savage *et al*., "Detour: informed Internet routing and transport," in *IEEE Micro*, vol. 19, no. 1, pp. 50-59, Jan.-Feb. 1999, doi: 10.1109/40.748796" and answer the following questions.

According to this paper:

1) What are the inefficiencies in the network-layer protocol?
2) What are the inefficiencies in the transport-layer protocol?
3) How to address these inefficiencies?

(**Note**: Please do not copy and paste the answers directly from the paper. Rather, we hope that you apply the knowledge you learn from this course to enrich your discussion here.)