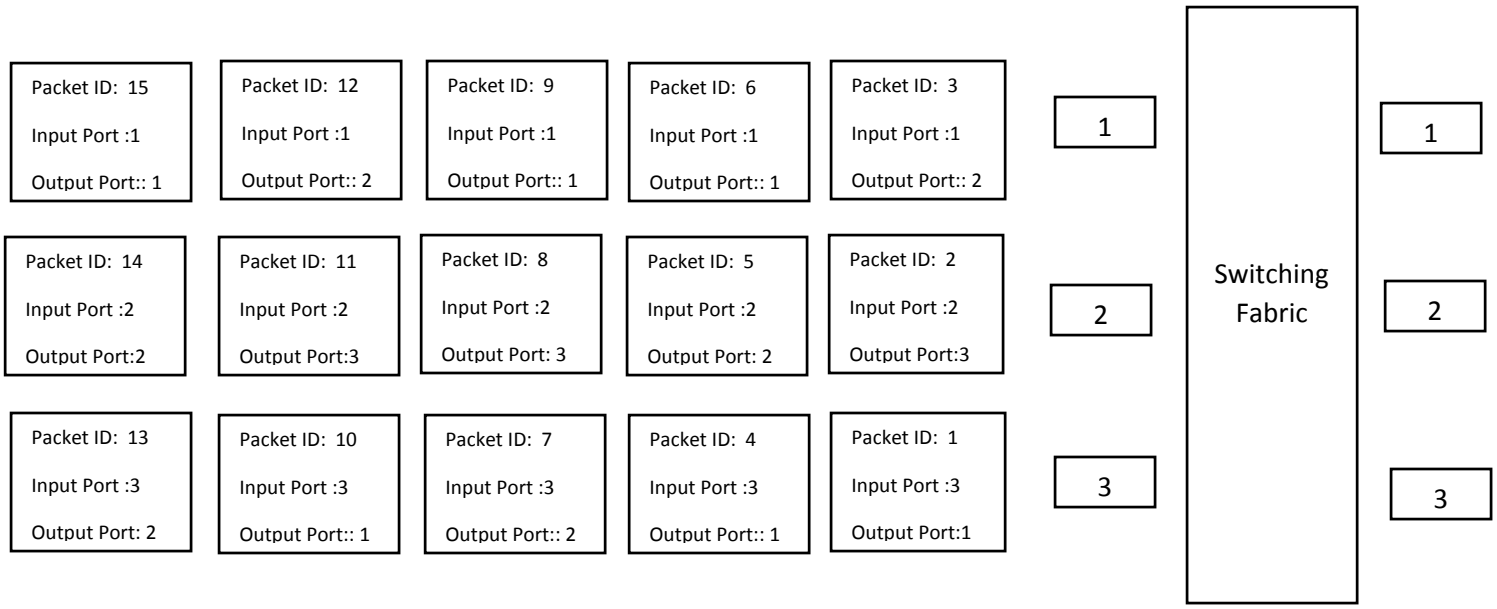
Problem Set 2

Network Layer + routing

(1)

A total of 15 packets (packet IDs 1-15) are queued in input ports 1-3 as shown below. These packets are to be transmitted through output ports 1-3 as indicated in the 15 boxes. Assume that at each time step packets are moved by the switching fabric to output ports 1-3 if there is no output port contention, and get transmitted. In the case of an output port contention, priority is given to the input port with the lower input port number; namely, the packet in the input port with the lower input number is moved to the output port and gets transmitted, and the other packet with contention stays in its input port.



Fill in the box below. (Note each output port can transmit one packet per time step.)

Time Steps		0	1	2	3	4	5	6	7	8
Output Ports	1									
	2									
	3									

This Tutorial was originally prepared by Prof. Tatsuya Suda

(2)

Given the routing table below, decide the next hop of a packet destined to the following IP addresses. (1) 118.219.239.1, (2) 118.219.239.178, (3) 120.219.159.1, (4) 120.219.160.2, (5) 121.154.1.56. (See below for the binary representations).

IP Address	Subnet Mask	Next Hop
118.219.239.0	255.255.255.128	Eth 0
118.219.238.0	255.255.240.0	Eth 2
118.219.208.0	255.255.240.0	B
120.219.128.0	255.255.224.0	C
<default>	----	D

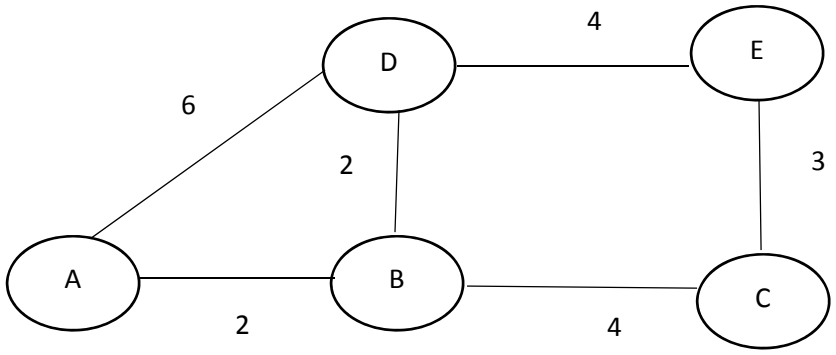
(3)

Consider an organization (X) with a class C network address (232.44.128.0). X has created four subnets: X1, X2, X3, and X4, and each subnet has exactly 62 hosts (including a router).

a) Show the subnet mask.
b) What are the broadcast addresses for each subnet?

(4)

Answer the following questions about a Distance Vector algorithm (Bellman Ford Algorithm). In the following Distance Vector routing algorithm, each router maintains a DV (Distance Vector) containing the best-known distance to each destination router. At a constant time interval ($t_0, t_1, t_2, t_3,$ and t_4), each router sends its DV to its immediate neighbors, which then update their own DVs.



(a)

Initially, the DVs of the five routers are as follows:

	A	B	C	D	E
Distance to A	0	2	6	4	8
Distance to A	2	0	4	2	6
Distance to A	6	4	0	6	3
Distance to A	4	2	6	0	4
Distance to E	8	6	3	4	0

Assume that the cost of link B-D has changed to 10 at time t_0. Write down DVs of all the five routers for next 3 iterations (t_1, t_2, and t_3) based on the Distance Vector algorithm.

(b) Compute the shortest paths using the Dijskstra's algorithm in the above figure -- for node A