Tutorial N° 2
Dynamique routing & IPv6

Exercise 1

1. What is the main role of the network layer in a computer network?
2. What are the key differences between routing and forwarding?
3. Give two example computer applications for which connection-oriented service is appropriate. Now give two examples for which connectionless service is best.
4. A router has the following CIDR entries in its routing table.

Address/Mask	Next Hop
135.46.56.0/22	Interface 0
135.46.60.0/22	Interface 1
192.53.40.0/23	Router 1
default	Router 2

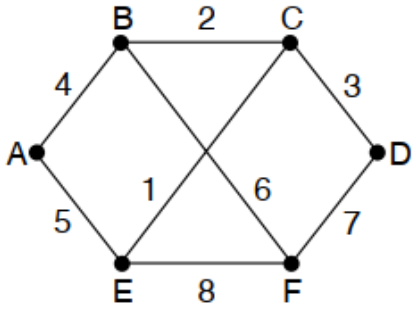
   For each of the following IP addresses, determine what the router does when a packet with that destination address arrives:

   (a) 135.46.63.10
   (b) 135.46.57.14
   (c) 135.46.52.2
   (d) 192.53.40.7
   (e) 192.53.56.7

5. Compare and contrast link-state and distance-vector routing algorithms.
6. Is it necessary that every autonomous system use the same intra-AS routing algorithm? Why or why not?
7. True or false: When an OSPF route sends its link state information, it is sent only to those nodes directly attached neighbors. Explain.
8. BGP is a distance-vector routing protocol. Does it suffer from slow convergence like traditional distance-vector protocols?

Exercise 2

Consider the network in the following figure.



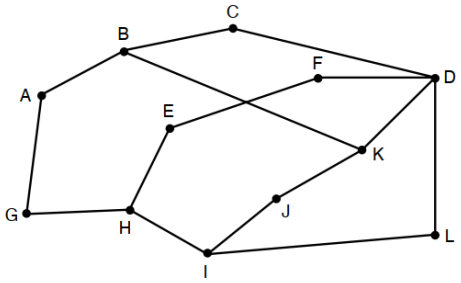
Distance vector routing is used, and the following vectors have just come into router C:

- from B: (5, 0, 8, 12, 6, 2)
- from D: (16, 12, 6, 0, 9, 10)
- from E: (7, 6, 3, 9, 0, 4).

The cost of the links from C to B, D, and E, are 6, 3, and 5, respectively. What is C's new routing table? Give both the outgoing line to use and the cost.

Exercise 3

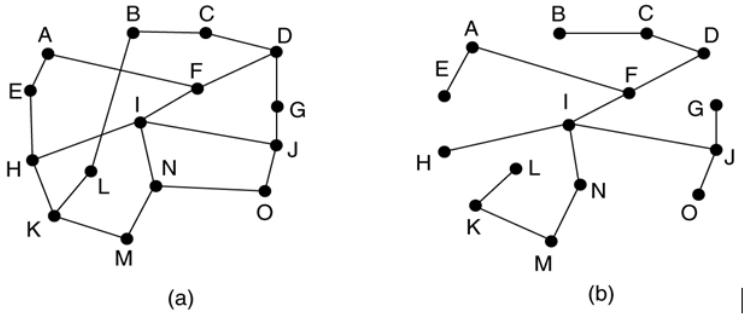
Compute a multicast spanning tree for router C in the following network for a group with members at routers A, B, C, D, E, F, I, and K



Exercise 4

In the network shown in the figure, the spanning tree (b) is used to perform broadcast.
If node I broadcasts a message to all nodes in the network:

1. How many hops will this message take?
2. What do you think about this number of hops?
3. Draw the multicast trees computed by the root node I for the following groups:
   - Group 1: A, B, C, D, F, I, H, N
   - Group 2: C, I, K, L, M, N
   - Group 3: I, B, E, O, G



4. Consider Group 2 from the previous question, calculate the number of hops taken by a message sent from node I to all members of the group, in the following cases:
   - When the multicast tree is used
   - When the message is sent individually to each member (using shortest-path routing in terms of hops)

Exercise 5

Let us consider a network using **link-state routing**. Router *A* has just received the following link-state information packets:

B		**C**		**D**		**E**		**F**		**G**		**H**	
N	C	N	C	N	C	N	C	N	C	N	C	N	C
A	2	B	7	C	3	B	2	C	3	A	6	D	2
C	7	D	3	H	2	F	2	E	2	E	1	F	2
E	2	F	3	–	–	G	1	H	2	H	4	G	4

Table 1: Link-state information packets received by router *A* (N: Neighbor, C: Cost)

- Draw the graph representing the network.
- Compute and draw the routing table of router *A*, specifying for each destination:
  - The outgoing interface (next hop)
  - The total path cost

Exercise 6

Two routers **R1** and **R2** are connected on the same Ethernet segment.

Parameter	**R1**	**R2**
IP Address	10.1.1.1/24	10.1.1.2/24
Area ID	0	0
Hello Interval	10 s	5 s
Dead Interval	40 s	20 s
Authentication	None	None

1. Will R1 and R2 become OSPF neighbors? Justify your answer.
2. At which stage of the adjacency process will the failure occur?
3. What configuration changes are required to establish adjacency?
4. List and explain the sequence of OSPF states until FULL adjacency.
5. If Hello timers are correctly configured and:
   - R1 has RID = 1.1.1.1
   - R2 has RID = 2.2.2.2

   Which router becomes the **Master**? Justify.
6. Can two routers reach the **Two-Way** state but not reach the **Full** state? Explain when this happens.