Computer Networks II
Exam of 21/01/2009
Solutions [sketch]

Question 1.a – Routing table at router R2

Destination	Next hop
Net A	R1
Net B	R1
Net C	Directly connected
Net D	R3
Net E	R4
Net F	R4
Net G	R4

Question 1.b – address assignment [possible solution]

- Possible to aggregate addresses in routers that route to network pairs (A,B), (C,D), (E,F);
- Check, as an exercise, other possible aggregations at routers

Net	Address	Mask	Available addresses
A	200.100.10.0	255.255.255.192	64
B	200.100.10.64	255.255.255.192	64
C	200.100.11.64	255.255.255.240	16
D	200.100.11.80	255.255.255.240	16
E	200.100.11.0	255.255.255.224	32
F	200.100.11.32	255.255.255.224	32
G	200.100.10.128	255.255.255.128	128

Question 1.c – whole IP network can be represented as **200.100.10.0/23** [512 indirizzi] in CIDR notation; a generic extgernal router must only analyze the 23 most significant bits to route towards the network [obviously assuming absence of multiple matchings on network prefix in routing table].

Question 2.a – Routing table at router R1

R1	**Destination**	*Net A*	*Net B*	*Net C*	*Net D*	*Net E*	*Net F*
	Distance	2	3	5	6	7	6
	Next hop	Dir. routing	Dir. routing	R2	R3	R2	R2

Question 2.b – Distance Vector sent from R2 to R1 and R5 a following fault at R4 [and hence to its incident links]

R2	**Destination**	*Net A*	*Net B*	*NetC*	*NetD*	*Net E*	*Net F*
	Distance	2	5	3	∞ [16]	∞ [16]	∞ [16]

Question 3.a

The terminal can use the STUN protocol to resolve the mapping for the same <local port, protocol> pair [for example port UDP 7000 used by APP] by contacting the 2 STUN servers in sequence.

Comparing the server replies, the NAT type is symmetric if and only if the mapping returned by the 2 servers in their respective binding response packets is different.

Question 3.b

Thye host can use the STUN protocol to resolve the mapping of the triple <192.168.0.5; 7000; UDP> simply by sending a STUN **binding request for IP address 192.168.0.5 and source port 7000** [STUN uses UDP] to one of the 2 available STUN servers.

The contacted STUN server will reply with a binding response that will contain the necessary information, that is, the global IP address and port used in the mapping.

The hypothesis that the NAT is full cone is necessary to be sure that the information obtained from the STUN protocol can be directly used

Question 4

The answer is no in general, in the sense that it depends on the link costs.

Bellman-Ford's algorithm proceeds in steps: at step K, paths between source node and other nodes are found, with the constraint that such paths contain **at most** K links.

The path from source x to another node y computed at the end of step K may not be the final one. This would instead be true if the costs on the links where unitary [we do not consider the case of null metrics].

In the next example consider $x=V_1$, $y=V_3$ and K=1; you can easily verify that:

- x and y have distance K = 1 **in hops**;
- the route to y computed in step K = 1 between x and y has length 5
- the shortes path between the same nodes has length 3 and is computed only at the end of iteration K=3