Name: _____
ID: _____

Network Architecture I: Exam 2

- Put your name and student id.
- The exam is closed book and closed note.
- You have 75 minutes to complete the exam.
- Answer all the questions directly on the exam papers (back page included). If you need additional sheets, let the instructor know.
- *Be brief, but do not omit necessary details.*
- If the problem appears to be ambiguous to you, write your assumptions along with your answer.
- Enjoy and Good luck!

1. (3 pt) Answer ‘true’ or ‘false’ to the following questions.

T or F

____ a) BGP allows for policy routing by filtering routes at the inbound and outbound points.

____ b) Ping program exploits ‘TTL expired’ ICMP message

____ c) Virtual circuit forwarding table keeps only the current connection states whereas packet switching forwarding table keeps entries for all possible destination.

2. (3 pt) Which of the following is *not* about NAT?
(Ans:____)

(a) Translates IP address and port numbers from/to internal to/from external network
(b) The same ip addresses can be used in an internal network
(c) Mask the true internal IP addresses of the internal network
(d) Connections have to be initiated from internal network

3. (3 pt) Which of the following is not routing protocol?
(Ans:____)

(a) IP
(b) RIP
(c) IGRP
(d) ICMP

4. (3 pt) Which of the following is *not* about multicasting?
(Ans:____)

(a) Multicast routing uses in-network duplication rather than source duplication
(b) Reverse path forwarding (RPF) removes cycle and broadcast/multicast storm
(c) In PIM-SM multicast member router sends *join* message to a center node (rendezvous point)
(d) Flood-and-prune RPF is effective when small portions of routers are multicast members

5. (8 pt) Below is a list of requests for network address allocations to a service provider. The service provider allocates addresses in the order of organization 1, 2, 3 and 4, beginning at 234.195.0.0.

Organization 1: 350 hosts
Organization 2: 1500 hosts
Organization 3: 400 hosts
Organization 4: 4000 hosts

Show the resulting address allocations with CIDR notation.

Once these have been allocated, also show the gaps that exist of unallocated addresses in between those of the networks above.

	Notation of CIDR Address allocation	Range of Addresses Allocated
Organization 1		
Organization 2		
Organization 3		
Organization 4		

Org1: 234.195.0.0/23
Range:234.195.0.0~234.195.1.255
Bin:[234.195.00000000.00000000 ~ 234.195.00000001.11111111]
Org2: 234.195.8.0/21
Range: 234.195.8.0~234.195.15.255
Bin:[234.195.00001000.00000000 ~ 234.195.00001111.11111111]
Org3: 234.195.2.0/23
Range:234.195.2.0~234.195.3.255
Bin:[234.195.00000010.00000000 ~ 234.195.00000011.11111111]
Org4: 234.195.16.0/20
Range:234.195.16.0~234.195.31.255
Bin:[234.195.00010000.00000000 ~ 234.195.00011111.11111111]

6. (10 pt) The table below is a routing table using CIDR. Address bytes are denoted in hexadecimal. The notation '/12' in C4.60.0.0/12 denotes a netmask with 12 leading 1-bits, that is FF.F0.0.0.

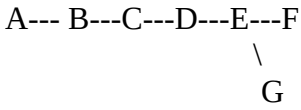
NetMask/Length	NextHop
C4.5E.2.0/23	A
C4.5E.4.0/22	B
C4.5E.C0.0/19	C
C4.5E.40.0/18	D
C4.4C.0.0/14	E
C0.0.0.2/2	F
80.0.0.0/1	G

Select to what next hop the packets with the following destination address will be delivered, following the longest prefix matching.

a. (5 pt) C4.5E.13.87

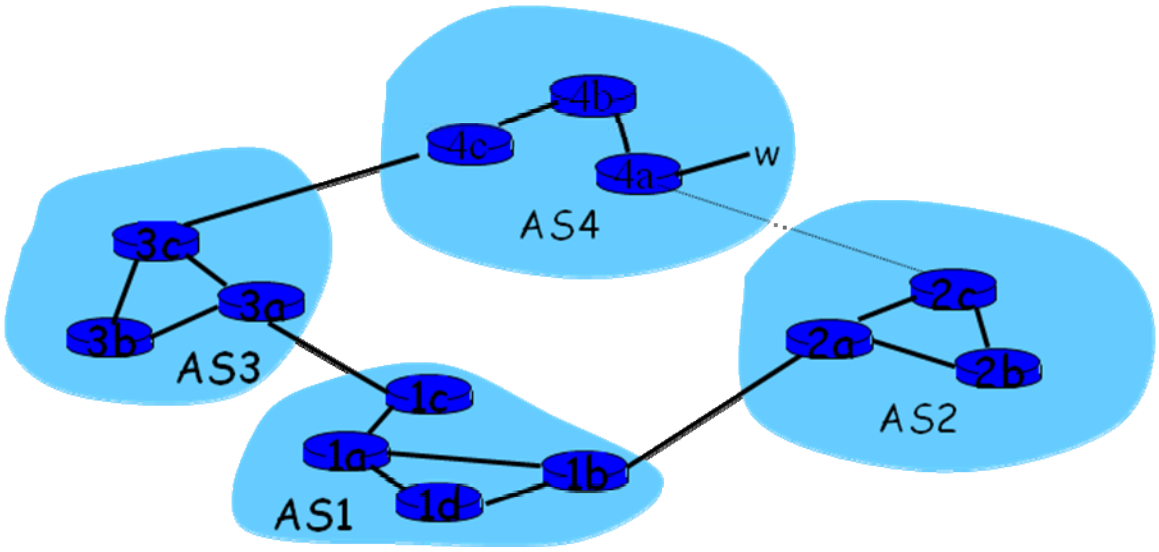
b. (5 pt) C4.5E.22.09

7. (12 pt) Consider multicast routing with presence of unicast routers



A is a multicast source host, F and G are multicast destination hosts. B, E are multicast-capable routers and C, D are only unicast routers. Assume multicast group address is ‘g’.
How tunneling can be done? Show IP packet source and destination addresses on the links between A---B, B---C, C---D, D---E, E---F, and E---G.

8. (12pt) Consider the network shown below. Suppose AS3 and AS2 are running OSPF for their intra-AS routing protocol. Suppose AS1 and AS4 are running RIP for their intra-AS routing protocol. Suppose eBGP and iBGP are used for the inter-AS routing protocol. Initially suppose there is no physical link between AS2 and AS4.

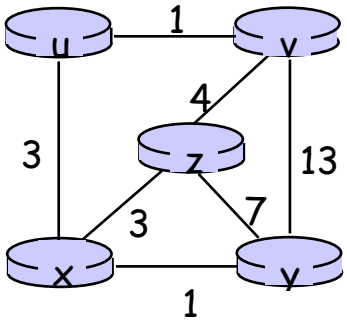


a. Once router 1d learns about *w*, what entry will be put in its forwarding table? i.e., (w,i_1) or (w,i_2) ? Explain why in one sentence.

b. Now suppose that there is a physical link between AS2 and AS4 shown by the dotted line. Suppose router 1d learns that w is accessible via AS2 as well as via AS3. Then what will the forwarding table entry for *w*? i.e., (w,i_1) or (w,i_2) ? Explain why in one sentence.

c. Now suppose there is another AS called AS5, which lies on the path between AS2 and AS4 (not shown in diagram). Suppose router 1d learns that w is accessible via AS2 AS5 AS4 as well as via AS3 AS2. Then what will the forwarding table entry for w? i.e., (w,i_1) or (w,i_2) ? Explain why in one sentence.

9. (8 pt) Consider the network shown below, and assume that each node initially knows the costs to each of its neighbors. Consider the distance vector algorithm and a) show the distance table entries at node **x**. Then b) construct its forwarding table.



10. (8 pt) Consider the same network shown above, and assume that each node initially knows the topology and costs of all links. Consider the link state algorithm and a) show the computation of Dijkstra algorithm at node **x**. Then b) construct its forwarding table from the shortest path tree constructed.

THE END