CSE 5344: Computer Networks

Fall 2021

Quiz 3

Student ID# ……

Student Name and Signature:……

Date: Nov 22, 2021

Time: 4:00 – 5:00 PM

Instruction:

1. Do not forget to put your name, ID and signature on the previous page
2. Do not detach the sheets
3. It is not open book quiz, so no external resources can be used while taking the quiz
4. Do not look left/right, you will be penalized -100, if you are caught cheating

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1. Choose the correct answer and/or fill in the blanks for following questions.
(Points: 10 x 5 =50 Points)

i. Round Robin (RR) scheduling and Weighted Fair Queuing (WFQ) are similar except that each class of packets has different weight in WFQ but same weight in RR.
……
…….

ii. With MTU = 1500 bytes, a given IP datagram of 5000 bytes (including IP header size) will be fragmented into
a. 4 fragments
b. 5 fragments
c. 6 fragments

iii. Network ID has all the host bits …0… and network bits remain unchanged (i.e. same as network bit of IP address)…

iv. Broadcast ID has all the host bits …1…… and network bits remain unchanged (i.e. same as network bit of IP address)…

v. What are the ranges of Class A, Class B and Class C IP Addresses?

Class A: 1 - 126
Class B: 128 - 191
Class C: 192 - 223

vi. Which class of IP supports maximum number of host?
a. Class A
b. Class B
c. Class C

vii. Which class of IP supports minimum number of network?

a. Class A
b. Class B
c. Class C

viii. Consider that we have a network ID of Class B: 172.16.0.0. Suppose it is needed to create 10 subnets, what will be the subnet mask for each subnet?

a. 255.255.192.0
b. 255.255.240.0
c. 255.255.224.0
d. 255.255.0.0

ix. Consider that we have a network ID of Class C: 192168.1.0. Suppose it is needed to support 12 hosts per subnet, what will be the subnet mask for each subnet?

a. 255.255.192.0
b. 255.255.240.0
c. 255.255.224.0
d. 255.255.0.0

x. What are eBGP and iBGP used for?
eBGP is used to communicate the path between Autonomous Systems (ASs) whereas iBGP is used to communicate path within an AS.

2.

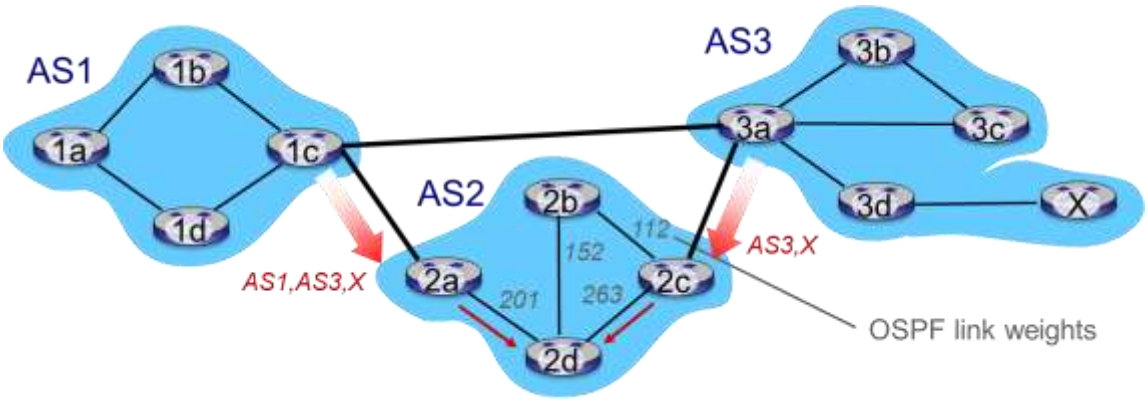
(a) Define an autonomous system (AS). **(6 Point)**

Autonomous System is a collection of network routers under one administration region/domain

(b) OSPF stand for …Open Shortest Path First .....and is used for …intra-AS …..routing. **(2 Points)**

(c) BGP stands for …Border Gateway Protocol……and is used for …inter-AS routing …….. **(2 Points)**

3.



In above diagram, the router 2d learns (via iBGP) that it can route to X (in AS3) via 2a or 2c

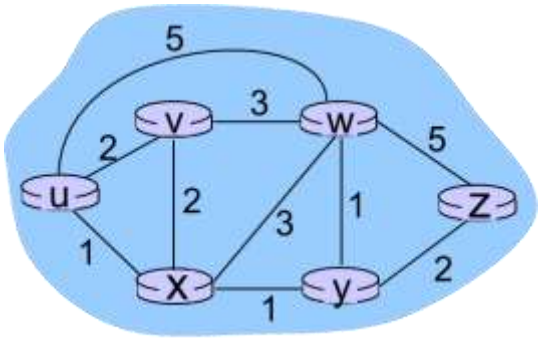
According to Hot Potato routing, which gateway (2a or 2c) the router 2d will choose to reach X and why? **(5 Points)**

According to Hot Potato routing, the router that has least intra-domain cost is chosen as local gateway. In the above diagram, router 2d has least cost to 2a than to 2c, so 2a will be chosen as local gateway to reach X.

4. As you know, the Distance Vector (DV) based routing algorithm calculates the cost of least-path from node x to node y using Bellman-Ford equation, which is expressed as

$$d_x(y) = \min_v \{c(x,v) + d_v(y)\}$$

where v indicates neighbor node(s) of x, $c(x,v)$ indicates cost to neighbor v and $d_v(y)$ indicates cost from neighbor v to destination y.



(a) Now using above equation, determine $d_u(z)$ for the network depicted above. Given information are $d_v(z) = 5$, $d_x(z) = 3$, $d_w(z) = 3$ **(10 Points)**

$d_u(z) = \min \{ c(u,v) + d_v(z), c(u,x) + d_x(z), c(u,w) + d_w(z) \}$

$= \min \{2 + 5, 1 + 3, 5 + 3\} = 4$

(b) Based upon your calculation in (a), which node will be inserted as next hop in the routing table and why? **(5 Points)**

In part(a), the node achieving the minimum cost is node x, so the node x will be inserted as next hop in the routing table

5. Consider that we have a network ID of Class B: **172.16.0.0**

a) How many bits (n) will be needed to create 10 subnets? **(5 Points)**

To create subnet 10, we need n bit such that it satisfies the relation

$2^n >= 10$

The above is true for n = 4, so 4 bits will be required

b) how many valid IP addresses will be there in each subnet? Show the calculation using any one subnet. **(10 Points)**

Since 4 bits from host portion is now borrowed to create subnets, it will be considered part of network bits. This leaves only 12 bits for host in each subnet.

With 12 bits, we will have 2^{12} number of IP addresses available, out of which one IP address will be Network ID (NID) and one Broadcast ID (BID).

Thus # of valid IP address will be 2^{12} -2

c) Find the subnet mask for the subnet. Show your work. **(5 Points)**

Since 12 bits are there for host, 20 bits will be there for network, and thus the subnet mask will be

11111111 . 11111111 . 11110000 . 00000000

= 255.255.240.0