University of Asia Pacific

Department of Computer Science and Engineering

Mid-Semester Examination Spring-2020

Program: BSc in Computer Science and Engineering

Course Title: Data Communication **Course No.:** CSE 303 **Credit:** 3.00

Time: 1.00 Hour. **Full Mark:** 60

Instruction(s): Answer any three questions including 1 and 2.

1. a. Suppose we have two topologies of computers in two rooms. One room has *X* computers connected with mesh topology and the other room has *Y* computers connected with star topology. **[6+6 =12]**

Here, X is the last digit of your ID +1
Y is the second last digit of your ID +1

For example, if your ID is 14101109 then
X = 9 +1 = 10
Y = 0 +1 = 1

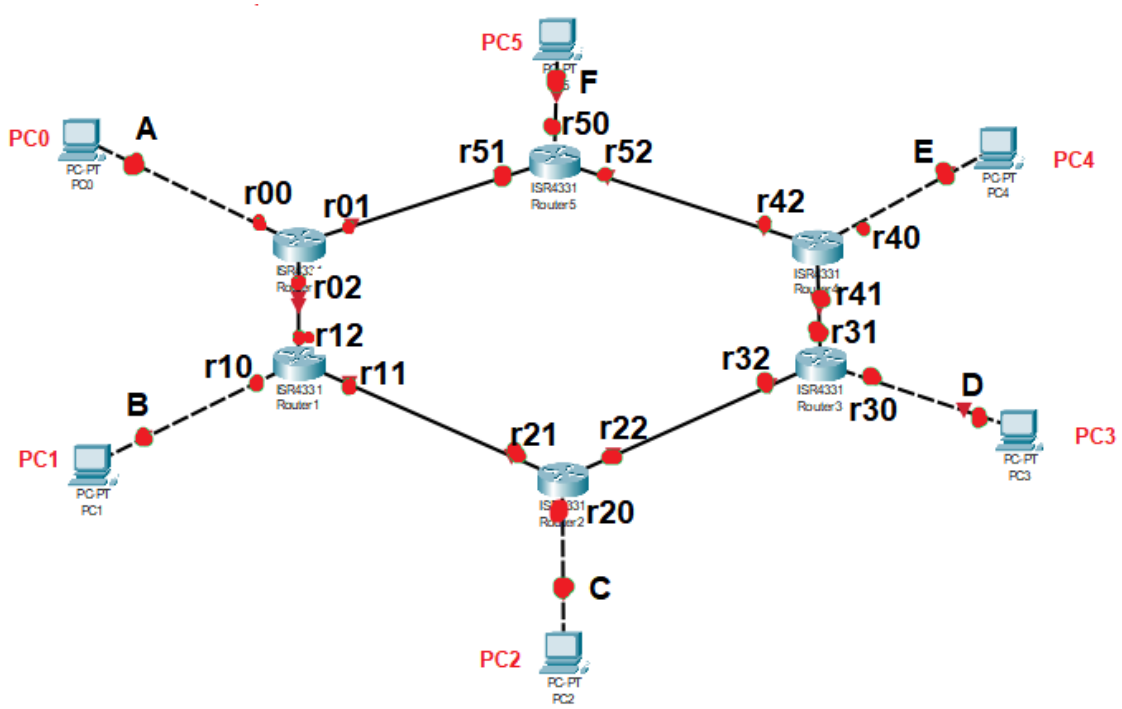
Calculate how many links you will need for each of the topologies.

If you were to choose between these two topologies for a more secure network which one will you prefer and why?

b. Suppose you want to communicate with your friend and you have a channel with 1000bps bandwidth. You can choose either half-duplex data flow or full-duplex data flow for your communication. **[4x2 =8]**

Write one advantage and one disadvantage for each of these two data flows.

2. a. Suppose, six computers are connected through six routers in following topology. **[12]**



You and your friend are sitting in two adjacent computers. You are in PCX and your friend is in PCY.

Here,

X = (last digit of Your ID)^2 mod 6,

Y = (X+1) mod 6

For example, if your ID is 14101102 then,

X = 2^2 mod 6 = 4 mod 6 = 4

Y = (4+1) mod 6 = 5 mod 6 = 5

So you will be in PC4 and your friend will be in PC5

Here, each red points holds an IP address.

Points A, B, C, D, E and F correspond to 6 computers. Points r00, r01 and r02 correspond to 3 points of Router0.

PC0 is connected through Router0, PC1 is connected through Router1 and so on.

Suppose, you are sending a frame from Process1 (port no: 6000) in PCX. Your friend will receive the frame in Process2 (port no: 7000) in PCY.

Show the following parts of your frame along the travelling points.

Sender MAC	Receiver MAC	Sender IP	Receiver IP	Port no of sender process	Port no of receiver process	DATA (No need to change this component)	Trailer (No need to change this component)

**For simplicity no need to use any numeric value for IP and MAC addresses. If you want to write IP address of point A or r00, just write "IP of A" or "IP of r00".

**Same goes for the MAC addresses. For MAC address of point A, write "MAC of A". For MAC address of point r00 write "MAC of r00"

**If you follow the shortest path, there will be exactly six points along the travelling path.

b. "Like Data link layer, **Error control** and **Flow control** are also performed in Transport layer in end-to-end rather than on single link." – explain this statement. **[4+4 =8]**

3. a. Normally due to travelling some distance the power of a signal gets attenuated/loses its power. The loss in a cable is usually defined in decibels per kilometer (dB/km). If the signal at the beginning of a cable with -0.3 dB/km has a power of 2 mW, what is the power of the signal at X km? **[6]**

Here, X = last two digits of your ID

For example,
If your ID is 14101102 then X = 2
If your ID is 14101150 then X = 50

b. "While the Shannon capacity gives us the upper limit; the Nyquist formula tells us how many signal levels we need"- Explain this statement. **[8]**

c. Draw the followings: **[6]**

i) Two signals with same amplitude and frequency but different phase
ii) Two signals with same amplitude and phase but different frequency
iii) Two signals with same phase and frequency but different amplitude

Or,

4. a. We have a channel with X MHz bandwidth. The SNR for this channel is 10*Y (Y multiplied by 10). What is the appropriate bit rate and signal level? **[12]**

Here, X is the last digit of your ID +1
Y is the second last digit of your ID +1

For example, if your ID is 14101109 then
X = 9 +1 = 10
Y = 0 +1 = 1

b. What is the difference between bandwidth and throughput? Can throughput be greater than bandwidth? **[8]**

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