

CPEG 572 Data and Computer Communications

ASSIGNMENT #1



Ch1:

Q.1

For each of the following networks, discuss the consequences if a connection fails

- a) Five devices arranged in a Mesh topology.
If a connection is broken, only one device will be disconnected from the network.
- b) Five devices arranged in a Star topology (not containing the Hub).
Unless the central machine is not failed, the broken connection will result in disconnection of one device from the network.
- c) Five devices arranged in a Ring.
A connection failure in ring will make it like a bus topology, so it may work with special arrangements, otherwise the network will fail.

Q.2

Performance is inversely related to delay. When we use the internet, which one of the following application are more sensitive to the delay?

- a) Sending an email
 - b) Copying a file
 - c) Surfing the internet
- Sending the email is more sensitive to delay.

Q.3

A color image uses 8 bits for low resolution and 16 bits for high resolution to represent a pixel. What is the maximum number of color that can be represented in each case?

An 8 bit will represent 2^8 colors and the 16 bit will represent 2^{16} colors.

Q.4

Assume six devices are arranged in a mesh topology. How many cables are needed? How many ports are needed for each device?

We will require $(n * (n-1)) / 2 = 6 * 5 / 2 = 15$ cables, since each device is connected to another 5 devices, so we require 5 ports on each device, so $6 * 5 = 30$ ports.



Ch2:

Q.1

Assume we have created a packet-switched internet. Using the TCP/IP protocol suite, we need to transfer a huge file. What are the advantage and disadvantage of sending a large packets?

Advantage: Faster route will be selected for transmitting data, if available

Disadvantage: larger file will require long time to transmit data.

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Q.2

Match the following to one or more layers of the TCP/IP protocol suite:

- a) Creating user datagrams
TRANSPORT LAYER
- b) Responsibility for handling frames between adjacent nodes
DATA LINK LAYER
- c) Transforming bits to electromagnetic signals
PHYSICAL LAYER
- d) Route determination
NETWORK LAYER
- e) Connection to transmission media
PHYSICAL LAYER
- f) Providing service to the end user
APPLICATION LAYER

Q.3

Assume that the system use five protocol layers. If the application program creates a message of 100 bytes and each layers (including the fifth and the first) add a header of ten bytes to the data unit. What is the efficiency (the ratio of application layer bytes to the number of byte transmitted) of the system?

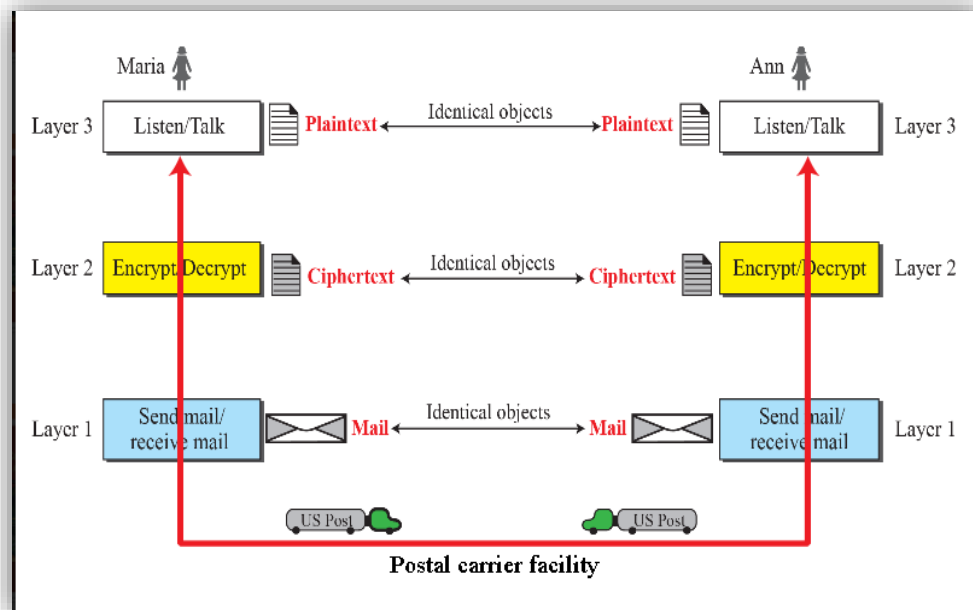
Number of bytes transmitted = $100 + 10 * 5 = 150$

Efficiency = $100 / 150 * 100 = 66\%$

Q.4

Answer the following question regarding the following figure.

Figure 1 : A Three Layer Protocol



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Case 1

Communication from Maria to Ann:

- a) What is the service provided by layer 1 to layer 2 at Maria's site?
Layer 1 will add envelop to ciphertext, and send it
- b) What is the service provided by layer 1 to layer 2 at Ann's site?
Layer 1 will receive the envelop, and will remove the envelop from ciphertext

Case 2

Communication from Maria to Ann:

- a) What is the service provided by layer 2 to layer 3 at Maria's site?
Layer 2 takes Plaintext from layer 3 and will encrypt it, and send it to layer 1
- b) What is the service provided by layer 2 to layer 3 at Ann's site?
Layer 2 receives ciphertext, decrypt it to plaintext and send the plaintext to layer 3

Q.5

Assume the number of hosts connected to the internet at year 2010 is five hundred million. If the number of hosts increase only 20 percent each year, what is the number of hosts in year 2020?

New Devices in 2010 is: 100,000,000.0

Total Devices in 2011 is: **600,000,000.0**

New Devices in 2011 is: 120,000,000.0

Total Devices in 2012 is: **720,000,000.0**

New Devices in 2012 is: 144,000,000.0

Total Devices in 2013 is: **864,000,000.0**

New Devices in 2013 is: 172,800,000.0

Total Devices in 2014 is: **1,036,800,000.0**

New Devices in 2014 is: 207,360,000.0

Total Devices in 2015 is: **1,244,160,000.0**
New Devices in 2015 is: 248,832,000.0
Total Devices in 2016 is: **1,492,992,000.0**
New Devices in 2016 is: 298,598,400.0
Total Devices in 2017 is: **1,791,590,400.0**
New Devices in 2017 is: 358,318,080.0
Total Devices in 2018 is: **2,149,908,480.0**
New Devices in 2018 is: 429,981,696.0
Total Devices in 2019 is: **2,579,890,176.0**
New Devices in 2019 is: 515,978,035.2 (round it to 515,978,036)
Total Devices in 2020 is: **3,095,868,211.2** (round it to **3,095,868,212**)
Total number of hosts by 2020 will be more than 3 billion