

Fayoum University - Faculty of  
Engineering Dept. of Electrical  
Engineering- Communication and  
Electronics Section



Final Exam - Fall 2009  
Time allowed:- 3 hrs

Computer Networks I  
Forth Year

January 24<sup>th</sup> 2010  
Dr:- Rania A. Abul Seoud

**Answer the following Questions:-**

**Question 1:- Answer True or False for the following statements.**

١. [ T ]The longer the frames or the shorter the propagation time, the higher utilization (efficiency) can be achieved in Ethernet LANs.
٢. [ T ]With Go-back-N error control protocol, it is not required that each individual frame be acknowledged.
٣. [ F ]In CSMA/CD LANs, the amount of time that it takes to detect a collision is never greater than the end-to-end propagation delay.
٤. [ T ]When the bit length of the link is greater than the frame length, multiple frames can be in transit at one time.
٥. When a switch sends a frame towards the final destination over a full duplex Ethernet interface, it should put as destination MAC address the MAC address of the next hop. Solution: False; the bridge does not modify MAC addresses.
٦. When a bridge has a packet ready to send on a full-duplex Ethernet port, it listens to the medium and waits until the medium is idle. Solution: False, there is no CSMA/CD over full duplex Ethernet.
٧. HTTP (HyperText Transfer Protocol) runs on top of UDP. ( F )

HTTP runs on top of TCP  
.....

**Question 2:-**

- a) State the different Wireless Security Approaches used in wireless networks.

- **User authentication** – Allows only authorized users to connect, send and receive data over the wireless network.
- **Encryption** – Provides encryption services further protecting the data from intruders.
- **Data authentication** – Ensures the integrity of the data, authenticating source and destination devices.

■ Three standards for securing wireless networks.

- **WEP (Wired Equivalent Privacy)** -a security protocol for WLANs) defined in the 802.11b standard.
- **WPA (Wireless Protected Access)**- Protected Access, a Wi-Fi standard that was designed to improve upon the security features of WEP.
- **WPA2 -Short for Wi-Fi Protected Access 2,** the follow on security method to WPA for wireless networks that provides stronger data protection and network access control, Based on the IEEE 802.11i standard

TCP uses a three-way handshake for reliable connection management, when establishing a logical end-to-end (process-to-process) connection.

**(a) What important control information is carried in the first TCP segment of the three-way handshake, and why?**

SYN flag to indicate request for start of a new TCP connection.  
Proposed initial sequence number (ISN) such as X.

**(b) What important control information is carried in the second TCP segment of the three-way handshake, and why?**

SYN-ACK flags: ack the SYN with X+1, to indicate willingness to connect.  
Proposed initial sequence number (ISN) such as Y for reverse direction.

**(c) What important control information is carried in the third TCP segment of the three-way handshake, and why?**

ACK flags: ack the SYN-ACK with Y+1, to indicate connection setup request is current and genuine.  
Connection setup is now complete, and data transfer may begin.

**(d) How many TCP segments are required to close a TCP connection?**

What important control information is carried in these TCP segments, and why?

Usually 3 or 4 segments, depending on the implementation.

FIN flag and closing sequence number from one endpoint A to indicate desire to terminate connection.

ACK flag from other endpoint B to indicate all data received.

FIN flag and closing sequence number from B to indicate willingness to close.

ACK from A to indicate all data received.

Note that both endpoints must indicate this before conn can be safely closed.

**Why does UDP not provide any flow control, nor any error control, nor retransmission if a receiver receives a bad segment?**

**Solution:**

UDP is designed for real time traffic and does not implement flow or error control in order to

minimize overhead in packet processing. UDP gives up quality for speed.

**The TCP/IP protocol suite includes two transport-layer protocols, UDP and TCP.**

**(a) How does UDP determine whether the received PDU is damaged?**

by performing a checksum calculation on the received UDP header and data and comparing with the checksum field in the header

**(b) What does UDP do when it detects an error on the received PDU?**

it simply discards the PDU and does not do anything about it

**5. Name and describe two types of frame errors that occur in the transmission of frames.**

(1) Lost Frame -- A frame fails to arrive at the receiver. A noise burst may damage a frame to the extent that the receiver is not aware that a frame has been transmitted.

(2) Damaged Frame -- A recognizable frame does arrive but some of the bits are in error.

**(c) What does the transport service using TCP guarantee to its users?**

error-free data delivery

sequenced (ordered) data delivery

**(d) What are "well-known" ports? Describe how they are used in the Internet. Give two examples of Internet application that uses a well-known port.**

Well-known ports are those which have been pre-assigned IANA to some frequently used Internet applications. The users accessing those applications (particularly servers) over the Internet only need to know their IP addresses

the following are examples of Internet applications using well-known ports: ftp (port 21), telnet (port 23), whois (port 43), finger (port 79), netstat (port 15), time (port 37), httpd (port 80)

**Question 3:-**

a) Assuming that framing at the data link layer is achieved by using starting and ending flags with bit stuffing. What is the original data bit-content if the data link frame *received* at the

destination station is as shown below?  
(1 Mark)

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

|  |  |  |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|--|

4. The following questions deal with CRC(Cyclic Redundancy Check) error detecting code.

(a) Given a message M = 1010001101, determine the CRC using the Pattern =110101

(b) What is the transmitted message?

T = 101000110101110

(c) How does the receiver check whether the message T was transmitted without any errors?

The received message T is divided by P and if the remainder is zero then T is error-free otherwise it contains errors.

```

          1101010110
          -----
110101 | 101000110100000
          110101
          -----
          111011
          110101
          -----
          111010
          110101
          -----
          111110
          110101
          -----
          101100
          110101
          -----
          110010
          110101
          -----
          01110   Thus, CRC = 01110

```

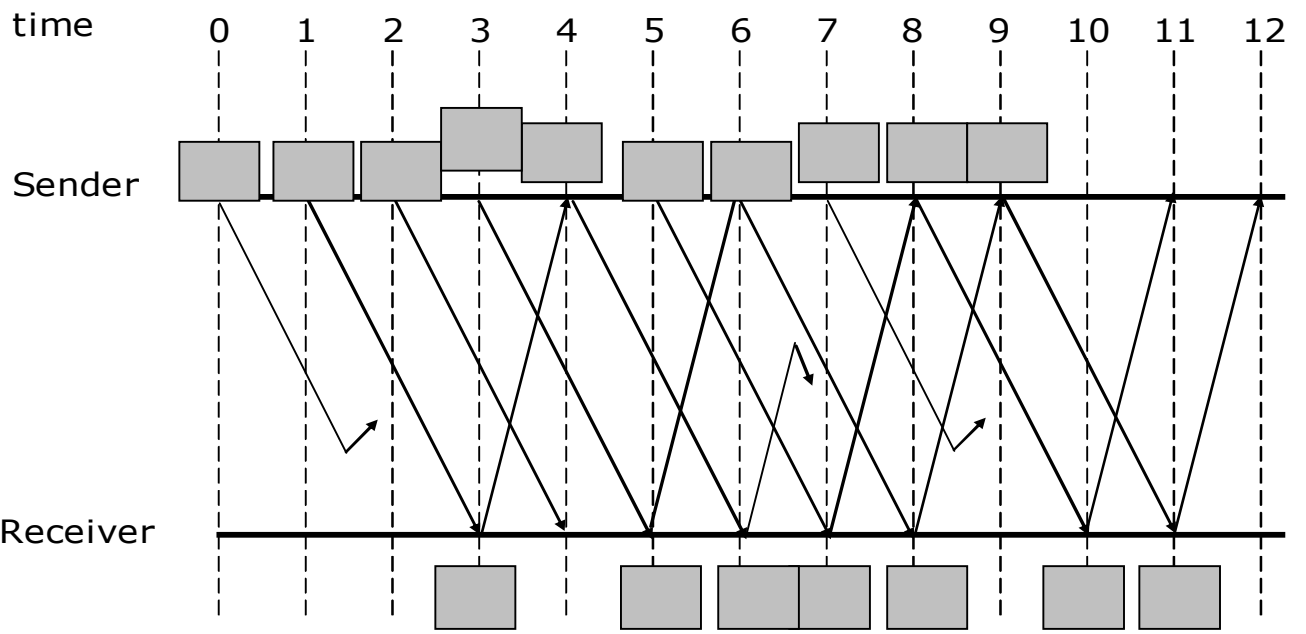
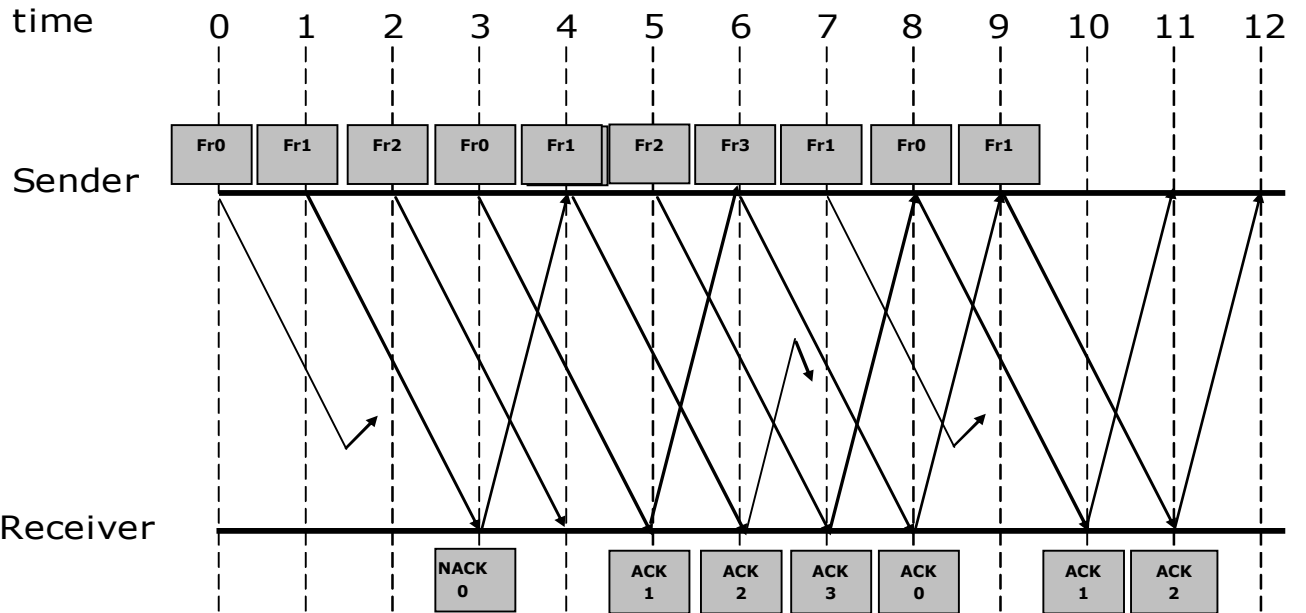
**Question 4:-**

Consider a link that uses selective repeat ARQ with a sending window size of  $W_S=3$  and receiving window size of  $W_R=1$ . Suppose that frames use a time-out value of 3 units. Also assume that ACK transmission time and the processing time are negligible. The figure below shows the operation of the ARQ protocol during the sending of M frames.

- i. What is the minimum number of bits that should be used for sequencing?

m=2

- ii. Insert the appropriate messages in the gray boxes in the figure below.



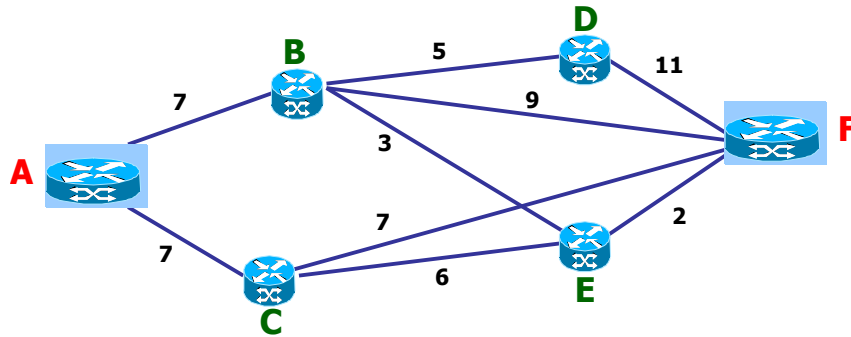
How many frames are forwarded to the upper layer

6 Frames

iii. Draw the source and destination sliding window (Note: indicating Frame Sequences that are allowed to be sent and outstanding frame sequences).

Problem 5:

a) Consider the packet switching network shown below.

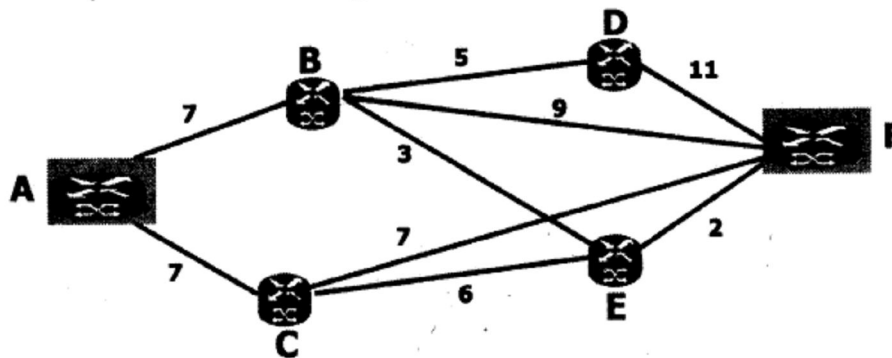


Given that the cost of each link represents the propagation delay over the link in milliseconds and the transmission time for each packet is equal to 12 ms, how long does it take to transfer a message composed of 10 packets from A to F (3Marks)

Good Luck

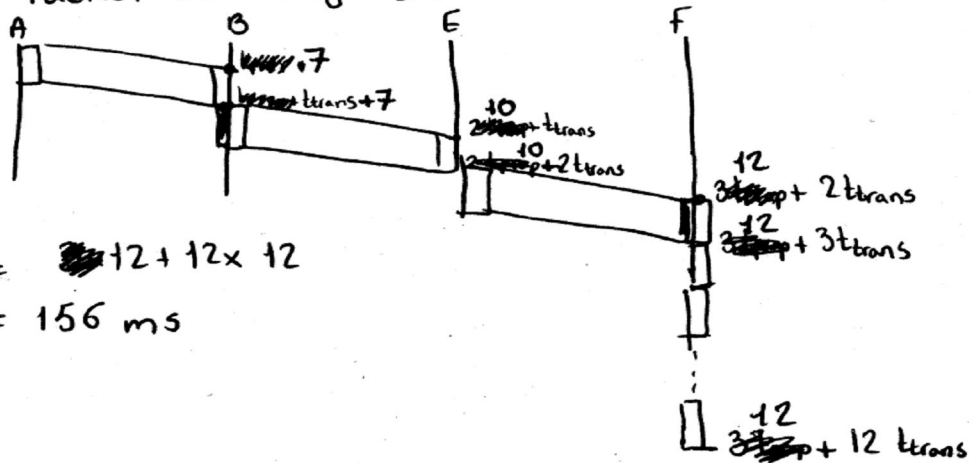
**Problem 5:**

a) Consider the packet switching network shown below.



ii) Given that the cost of each link represents the propagation delay over the link in milliseconds and the transmission time for each packet is equal to 12 ms, how long does it take to transfer a message composed of 10 packets from A to F (3 Marks)

Packet switching as shown



$$\text{Delay} = 12 + 12 \times 12 = 156 \text{ ms}$$