B. Tech
CN, IT 3001
[CSE & IT]

Supplementary Mid-Semester Examination – 2018

COMPUTER NETWORKS
[IT 3001]

Full Marks: 25 Time : 1 Hour 30 mins

(Answer any 5 questions, including Question no. 1)

1. Answer all the questions [1*5]
   i. Suppose N packets arrive simultaneously at a router every T seconds, the packets are of size S bits and the transmission rate of the router is R bps. What should the minimum value of T be such that the queuing delay does not grow without bound?

      Ans: NS/R

   ii. In Stop-and-Wait ARQ, the sequence numbers are based on modulo-2 arithmetic. Why?

      Ans: In Stop-and-Wait ARQ the sequence numbers can only varies between 0 and 1 hence it is based on modulo-2 arithmetic.

   iii. What is the need of DF flag during data communication?

      Ans: A DF bit is a bit within the IP header that determines whether a router is allowed to fragment a packet. If it is set then router will not fragment the packet even if the size of the packet is more than the MTU.

   iv. In what situations contention based MAC protocols are suitable?

      Ans: Contention based MAC protocols are suitable for bursty nature of traffic under light to moderate load.

   v. Specify under what conditions tcp state goes directly from FIN_WAIT_1 to TIME_WAIT?

      Ans: In 3-way handshaking during connection teardown tcp state goes directly from FIN_WAIT_1 to TIME_WAIT.

2. a) Suppose a user wants to access a webpage with 5 embed objects all residing on the same server. Assume that length of the request messages is 100B, all objects are under 200B and TCP MSS of 1400B. How many RTT would it take to display the webpage fully for the followings. [3]
   i. non-persistent HTTP with parallel TCP connections?
   Ans: 4.
   1 RTT: TCP handshaking for getting base object

1 RTT: Requesting and getting base object
2RTT: for getting each of the embed object over a new parallel TCP connection
Total = 2RTT+ 2RTT = 4RTT
ii. Persistent HTTP with pipelined TCP connections?
Ans: 3.
1 RTT: TCP handshaking for getting base object
1 RTT: Requesting and getting base object
1 RTT: for getting the embed object over the same TCP connection. All requests and responses are piggybacked in same TCP segment.
Total = 2RTT+ 1RTT = 3RTT

b) If the bandwidth of the link is 256 mbps, Assume that sequence number field consists 32 bits. Find the wrap around time for sequence number. [2]

Ans: no. of uniqe sequence numbers are = 2^32 i.e 2^32 bytes of data can be represented with uniqe sesquence numbers after that the sequence numbers will be repeated again.

Hence no. of bits associated with unique sequence numbes = (2^32)*8
As per the given problem, no. of bits transmitted in 1sec = 256 mb i.e 256*(10^6) bits
Hence to transmit (2^32)*8 bits it requires = ((2^32)*8)/(256*(10^6)) sec = 134.2 sec

3. a) A 100km long cable runs at 1.536 mbps. The propagation speed in the cable is 2/3 of speed of light. Calculate the number of bits that would be fit in the cable? [3]

Ans:
Speed of light in vaccum=3*10^8 m/sec
propagation speed in the cable = (2/3) *(3*10^8) m/sec = 2*10^8 m/sec
propagation delay = 100km/(2*10^8 m/sec) = 1/2000 sec
number of bits that would be fit in the cable = 1.536 mbps * (1/2000 sec) = 768 bits

b) Consider sending a packet from a source host to a destination host over a fixed route. List and Explain the delay components in the end-to-end delay. Which of these delays are constant and which are variable? [2]

4. a) What is NAT and its responsibility ? Briefly explain, how NAT works through an example. [3]

b) Distinguish between a time-out event and the three-duplicate-ACKs event. Which one is a stronger sign of congestion in the network and Why? [2]

Ans: time-out event is a stronger sign of congestion than three-duplicate-ACKs because in case of three-duplicate-ACKs the congestion has happened for a short period of time and it is recovered after that. But in case of time-out event the congestion has occured and it did not recovered from that.

5. a) Suppose the maximum time an IP datagram can stay in the network before being delivered to the receiver is 40 sec. What is the maximum rate a host should send out datagrams so as to avoid confusion during reassembly of fragments at the receiver? Assume the datagram size of 1000 Bytes. [3]

Ans: We need to ensure that the identification field does not wrap around within 40 sec.

Since identification field is 16 bits, that means a host can send 2^16 datagrams in 40 sec before wrap around occurs.

So, data rate of sending should be kept under 2^16 * 1000 * 8 bits / 40 sec to prevent wrap around.

As long as its under, given the fact that no datagram stays past 40 sec in the network, wrap around does not happen.

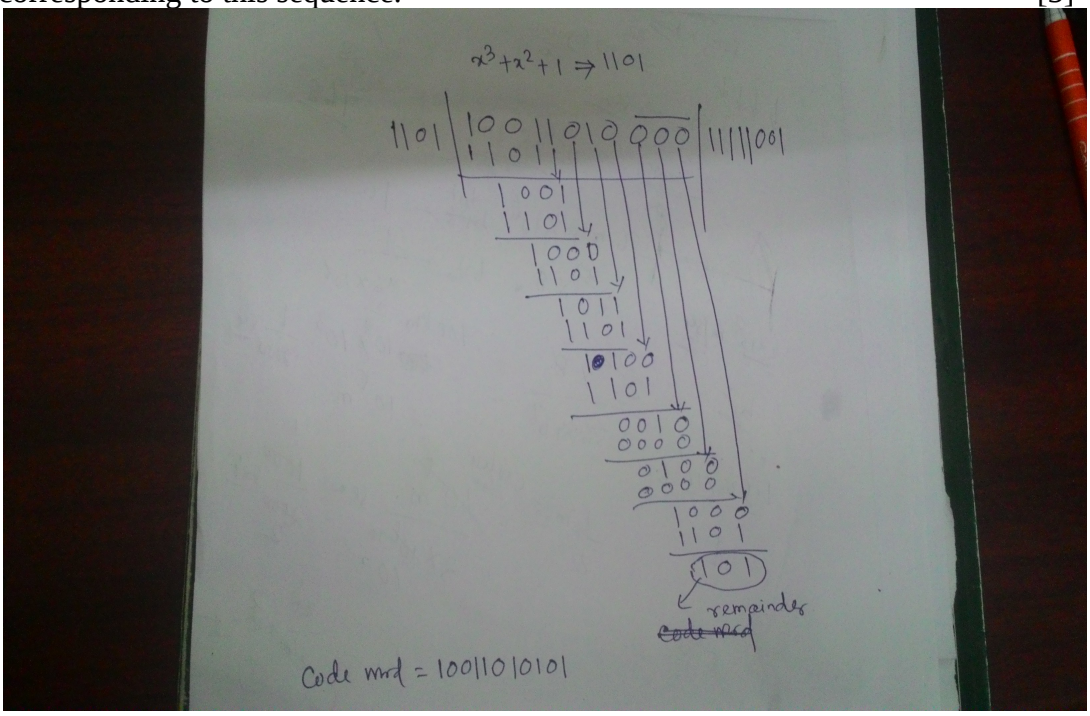
So rate is < 13.1Mbps

b) In ftp, the control connection and the data connection are intiaited by which entity in active mode of communication. Justify why there are two modes of communication ?[2]

Ans: In active mode of communication ftp client initates the control connection where as ftp server initates the data connection.

In case, the client is setup with a firewal not to allow any outsider to acess his machine then the active mode of communication will not work. Hence anathor mode called the passive mode of communication will help to do the ftp communication by initiating both the control connection and the data connection to the server.

6. a) Explain how CRC is used in detecting Errors for the following polynomial, g(x)=x3+x2+1. Consider the information Sequence 10011010. Find the codeword corresponding to this sequence. [3]



b) Discuss CSMA/CD protocol. Explain, why it is not suitable for wireless LAN.[2]

Ans : The key point why CSMA/CD protocol will not be suitable for wireless LAN is that, In case of wireless LAN the signal fades away very fast and hence it is very difficult to detect the collision. CSMA/CD protocol relies on collision detection techniquie which is difficult in wireless hence CSMA/CD protocol is not suitable for wireless LAN.

7. a) An organization requires to setup 1000 hosts in a single network. Describe whether classful or classless addressing will be helpful in reducing the wastage of IP address assignment for this requirement? Also suggest a network id and netmask to fulfil this requirement. [3]

Ans:
minimum no. of host bits required to set up 1000 hosts = 10.

In a classful IP addresing scheme, we need a class B network to suffice this requirement.
In a class B network, no. of hosts that can be configured = (2^16) -2
This is much more than the required no. of hosts=1000.
Hence in this case using classful IP adressing the wastage of IP addresses are huge.

But If we consider a classless IP addressing schme, then no. ff host bits will be = 10.
Now with 10bits we can configure maximum number of hosts = (2^10)-2 =1022
Hence in this case using classless IP adressing the wastage of IP addresses are very minimal.
Suggested Network id = X.Y.Z.0
(where X and Y can range from 0-255, Z can range from 0-252 as the no. of host bits =10)
Netmask = 255.255.252.0

b) Explain Distance vector routing algorithm along with its limitation and how it has been overcome. [2]