

Department of Computer Science and Engineering
Motilal Nehru National Institute of Technology
Midterm Exam, Computer Networks(CA3302)
MCA III Semester
Time: 1.5 Hour, MM:20

Note: There are four questions. Attempt all.

1. In this question you have to describe that how source host learns about Source IP, Destination IP, Source Port, Destination Port, Source MAC and Destination MAC in the following situations:
 - (a) When both source and destination hosts are in same subnet and want to establish a telnet session.
 - (b) When both source and destination hosts are in different subnet and want to establish a telnet session.
 - (c) Suppose a host A is in the private network behind NAT/proxy and want to access www.google.com web page.
2.
 - (a) Compare GBN and SR in brief. Assume that the timeout values for both protocols are sufficiently long such that 5 consecutive data segments and their corresponding ACKs can be received (if not lost in the channel) by the receiving host (Host B) and the sending host (Host A) respectively. Suppose Host A sends 5 data segments to Host B, and the 2nd segment (sent from A) is lost. In the end, all 5 data segments have been correctly received by Host B. How many segments has Host A sent in total and how many ACKs has Host B sent in total? What are their sequence numbers? Answer this question for both protocols.
 - (b) Suppose that s bits are used to represent the sequence number. In class we said that the maximum window size W for Go-Back-N protocol is $W = N - 1$, where $N = 2^s$. The claim is that this is correct only when the packets cannot be re-ordered by the network during the retransmission, i.e., *a packet, $P1$, sent before another packet, $P2$, by the sender cannot show up at the receiver later than $P2$!* Use an example (say, use $s = 2$) to show why $W = N - 1$ will not work correctly if the network can indeed re-order the packets.
3. Assume that any client wants to retrieve the www.timesnow.tv home page but has no information about the www.timesnow.tv web server IP address.
 - (a) Describe the process of the client obtaining the IP address for the hostname www.timesnow.tv under the assumption that it is not cached at the local DNS server and that the local DNS server has not cached an entry for the [.tv](http://www.timesnow.tv) DNS server.
 - (b) The www.timesnow.tv is a very popular website and the many client requests cannot be handled by a single server but rather by a cluster of web servers (each having a different IP address). Describe the process that DNS offers for load balancing.
 - (c) Give an example for the source and destination port numbers in a TCP segment sent from the client to the www.timesnow.tv web server. Now assume a second browser is opened on the client which also wants to retrieve the www.timesnow.tv start page. What are source and destination port for a TCP packet that belongs to this connection?
 - (d) Assume there is an institutional cache in the client's subnet. The client's initial request is cached by this cache. Since news page change frequently the client wants to make sure that it does not get served an outdated HTML page from the cache. Explain the HTTP mechanism that prevents this from happening. Explain with an example containing HTTP requests and responses.
 - (e) DNS queries and replies are transferred between a local DNS server and the authoritative DNS server using UDP over port 53. Since UDP does not guarantee reliable delivery of data, DNS servers themselves need to ensure reliable delivery of queries and replies. Please describe a scheme that the DNS servers can use to achieve this purpose.

4. (a) Suppose that Mayank wants to send an email message to Manoj. This will involve four entities: Mayank's mail client (for email composition and sending), Mayank's outgoing mail server, Manoj's incoming mail server, and Manoj's mail client (for email retrieval and viewing). Between which of these four entities does the SMTP protocol operate? What about the IMAP protocol?
- (b) What is the purpose of the HTTP "COOKIE:" field? Are the values in the HTTP message's cookie field stored at the client or server or both? Explain briefly.
- (c) Suppose that we want to change the IP address of cse.mnnit.ac.in from 128.119.40.186 to 128.119.40.187 and change this mapping in the DNS authoritative name server for cse.mnnit.ac.in. Once this mapping is changed in the authoritative name server, will all future references (generated anywhere in the Internet) to cse.mnnit.ac.in then be sent to 128.119.40.187? Explain briefly.
- (d) We saw that TCP and UDP provide two very different service models. Suppose that an application wants all of the functionality provided by UDP but only some of the functionality provided by TCP (e.g., the application wants reliable message transfer and flow control, but not congestion control). How would an application get this different service in today's Internet?