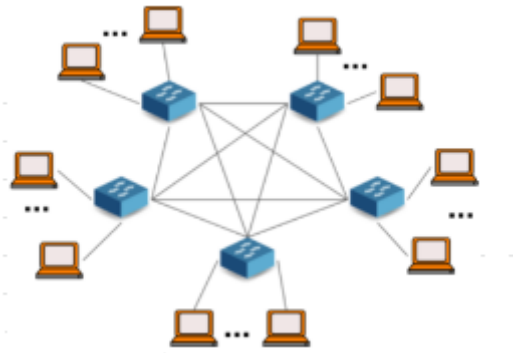
Mid – sem Exam
Total marks: 22

Q1) Consider a network with 5 network switches. Each switch is connected to every other switch as shown in the figure. Assume that a total of 100 edge devices are connected to these 5 switches.



Assume connection from edge A to edge B and edge B to edge A as the same connection, i.e., count this as a single connection.
What is the maximum number of connections you can have, if this is

(a) a circuit switched network

(b) a packet switched network (assume infinite bandwidth/capacity at the core network)?

(a) _____ connections (b) _____ connections [1+1 marks]

Solution: (a) 10
(b) 4950

Q2) Even though both the client browser and the webserver maintains a database of client state in terms of cookies, why is HTTP called stateless protocol?

a) It is stateless because the cookie state is set only when the client visits the website
b) The cookie state is not about HTTP requests or TCP connections, hence it is stateless
c) The cookie is sent through HTTP connection hence the server does not maintain state
d) It is not the HTTP protocol that maintains state, it is the browser and the webserver

[1 marks]

"Option D: It is the not the HTTP protocol that maintains state, it is the browser and the webserver"

Q3) Suppose IIITD has 1 Gbps LAN and the access link rate between IIITD and NKN server is 12Mbps, the Internet delay is 2 sec, the browsers generate web requests on an average of 10 requests per sec. Each request size is 1Mb. Assume that IIITD uses web cache to accelerate the web requests and the cache hit rate is 30%. Compute the following for the above described scenario.

(a.) LAN utilization = _____, [1 marks]
(b.) access link utilization = _____, [1 marks]
(c.) average end-to-end delay = _____seconds (answer upto 4 decimal places) [2 marks]

LAN utilization=10Mb/1Gbps=0.01
Access link utilization=0.5833
Avg end-to-end-delay=1.4593 seconds

Q4) Host "Jupiter" is serving client requests coming to the TCP port (say, port 80) and the UDP port (say, port 69). Suppose that the TCP server process concurrently receives requests from 10 clients (the client requests may come from same machine or different machines), and the UDP server process concurrently receives requests from 1000 clients (all requests come from different machines). Which of the following statements are TRUE for the above scenario? Provide justification in the rough sheet.
A) Jupiter has opened 10 TCP sockets & 1000 UDP sockets (ignore listening sockets)
B) Jupiter has opened 10 TCP sockets & 1 UDP socket (ignore listening sockets)
C) Total number of sockets opened by the TCP & UDP clients: 10 and 1000, respectively
D) Total number of sockets opened by the TCP & UDP clients: <=10 and 1000, respectively
E) Total number of sockets opened by the TCP & UDP clients: 10 and <=1000, respectively

a) A & C are TRUE
b) A & D are TRUE
c) B & E are TRUE
d) B & C are TRUE [2 marks]

"Option D: B & C are TRUE"

Q5) Suppose your browser makes a DNS request for resolution of one hostname via the local DNS server. Consider the following resolution schemes (a) iterative resolution (b) recursive resolution. The response from the **authorative server** will be first sent to
(a.) _____ (iterative resolution)
(b.) _____ (recursive resolution)

a) a) Root DNS server b) Local DNS server
b) a) TLD server b) Local DNS server
c) a) Local DNS server b) TLD server
d) a) Local DNS server b) Root DNS server [1 marks]

Option C: a) local DNS server b) TLD server"

Q6) Consider different activities related to browser.
b1: Open mail.google.com that requires authentication
b2: Send an email to friend@yahoo.com
b3: Gmail server sends the mail to yahoo mail server
b4: Your friend opens her laptop and receives the email
Identify which of these activities are push based and which ones are pull based

a) b1: push, b2:push, b3: push, b4:pull
b) b1:push, b2: push: b3:pull: b4:push
c) b1: pull, b2:push, b3: push, b4: pull
d) b1:pull, b2: push, b3: push, b4: push

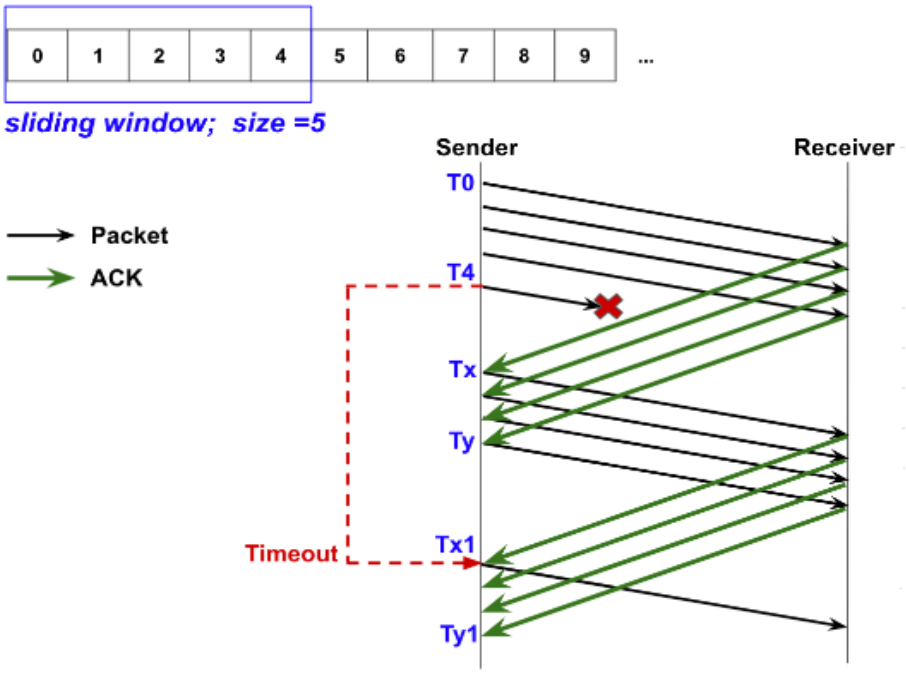
[1 marks]

"Option C: b1: pull, b2: push, b3: push, b4: pull"

Q7) An application on Alice's machine wants to open a TCP connection with a server application on Bob's machine using Bob's IP address. Alice and Bob are located on different networks. Alice cannot see any error message but simply cannot connect (maybe the application is written poorly). Which of the following tools should NOT be used to debug the problem? Provide justification in the space provided in ""other"" option.
A. ping
B. wireshark, tcpdump
C. nslookup
D. netsat
E. traceroute
F. dig [1 marks]

Answer: C and F
Since the IP address is already known, any tool for DNS server debug will not be useful

Q8) Consider the sender-receiver communication as shown in the figure. Assume that the receiver sends an acknowledgement with the same sequence number as that of the sequence number of the received packet, i.e., the receiver will generate an acknowledgement number 0 for a packet received with sequence number 0. The initial state of the sender's window is shown in the figure.



Given that the sender-receiver pair uses Go-Back-N protocol (out-of-order packets are discarded), answer the following.
(a.) Sequence number of the acknowledgements received at Tx is ____, Ty is ____, Tx1 is ____, and Ty1 is ____

(b.) Sequence number of packets sent at Tx is ____, Ty is ____, Tx1 is ____, and the sequence number of the last packet in the window that can be transmitted at Ty1 is ____

Answer the same question, given that the sender-receiver pair follows selective repeat protocol, that is,
(c.) Sequence number of the acknowledgements received at Tx is ____, Ty is ____, Tx1 is ____, and Ty1 is ____

(d.) Sequence number of packets sent at Tx is ____, Ty is ____, Tx1 is ____, and the sequence number of the last packet in the window that can be transmitted at Ty1 is ____

Use rough sheet to show the working of the problem
[2+2+2+2 marks]

Answer: Go-back-N:

a. 0,3,3,3
b. 5,8,4,8
Selective repeat:
c. 0,3,5,8
d. 5,8,4,4

Q9) Suppose Alice and Bob are sending 1 Kb packets over a 1 Mbps network link. The round trip delay is 10 msec. What is the sender utilization for the following cases? (Use rough sheet to show the working of the problem)
(a.) If stop & wait reliable data transfer protocol is used (assume there are no errors), sender utilization = _____

(b.) If sliding window protocol is used (assume there are no errors, and the sender window size is 100), sender utilization = _____ [1+1 marks]

a. **0.09**
b. **1**