College of Engineering, Pune
Dept of Computer Engineering & Information Technology
End Semester Examination – Nov - 2013
Network Architecture and Wireless Protocols
(Third Year B.Tech Information Technology)

Durations: 3 hrs Max. Marks- 60

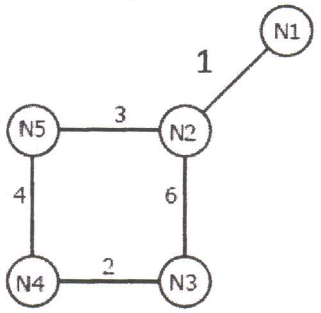
Instructions:

1. Answer any 6 complete questions.

Marks

Q. 1 a) Is it possible that a router implements several types of link layers? Justify with an example 3

b) Consider a network with five nodes, N1 to N5, as shown below 5



The network uses a Distance Vector Routing protocol. Once the routes have stabilized, what are the distance vectors at different nodes? If The cost of link N2-N3 reduces to 2, after the next round of updates, what will be the new distance vectors different nodes?

c) Usually a local area network has larger MTU (Eg. Ethernet 1500B) than a wide area network (eg. less than 576B). Why the network is designed so? 2

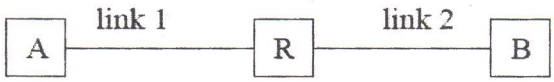
Q. 2 a) Consider a subnet with prefix 128.119.40.128/26. Give an example of one IP address that can be assigned to this network. Suppose an ISP owns the block of addresses of the form 128.119.40.64/26. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets? 3

b) There are many important differences between implementing the multicast abstraction via multiple unicasts versus a network of routers supporting multicast groups, in terms of what each sender needs to know about. What are these differences? How scalable are they? 4

c) How does BGP avoid formation of routing loops? 3

Q. 3 a) What does traceroute command do? Which protocol does it make utilize and how? 4

b) Consider the following network topology, with hosts A and B connected through router R: 4



Which among the header fields in the following list that router will change between when it receives the packet on eth0 and when it transmits the packet on eth1? Why?

Ethernet Header:

A. Source address
B. Destination address
C. EtherType

IP Header:

A. Source address
B. Destination address
C. Protocol
D. TTL
E. Header Length
F. Header Checksum
G. Identification

c) Compare IPv4 and IPv6 with respect to the addressing 2

- Broadcast addresses
- Loopback address
- Multicast address
- Private IP addresses to use within the organization

Q. 4 a) Suppose application A is using a stream (TCP) socket to transfer data to application B on a remote host. Suppose application A writes (sends()) data into the socket buffer ten times. 4

i) Can the underlying network stack transmit *more* than ten data packets? If so, why?

ii) Can the underlying network stack transmit *fewer* than ten data packets? If so, why?

b) If two nodes use TCP to send data but only send one character per segment (e.g., by using the PUSH operation), what is the channel utilization? 3

c) Suppose that host A sends two TCP segments back to back to host B over a TCP connection. The first segment has sequence number 90; the second has sequence number 110. 3

i) How much data is in the first segment?

ii) Suppose that the first segment is lost but the second segment arrives at B. In a piggybacked acknowledgement that host B then sends to host A, what will be the acknowledgement number?

Q. 5 a) Describe why an application developer may choose to run an application over UDP rather than TCP. 3

b) Consider the following graph of TCP throughput, where the y-axis describes the TCP window size of the sender. 5

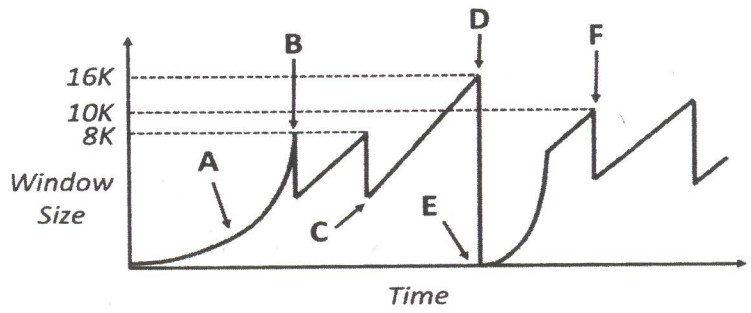
i) Consider the curved slope labeled by point A. Why does the TCP window behave in such a manner, rather than have a linear slope?

ii) Name the event at B that occurs that causes the sender to decrease its window.

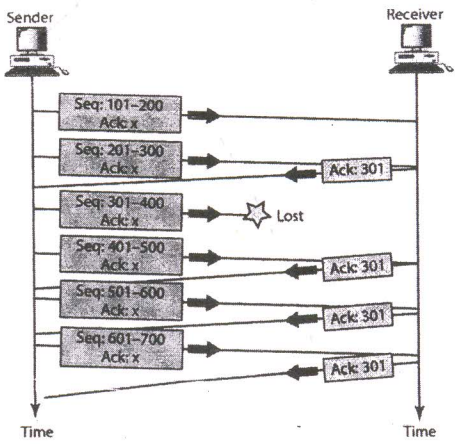
iii) Does the event at B necessitate that the network discarded a packet (Yes or No)? Why or why not?

iv) Name the event at D which occurs that causes the sender to decrease its window.

v) Does the event at D necessitate that the network discarded a packet (Yes or No)? Why or why not?

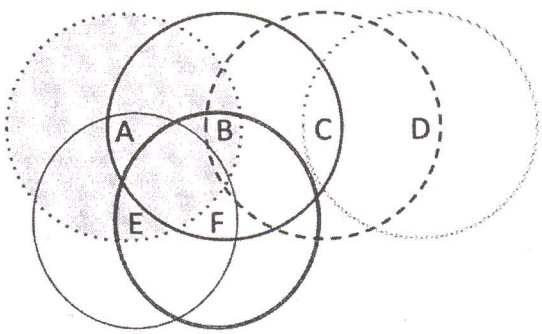


c) Consider the following TCP scenario. How does TCP react at this situation? 2



Q. 6 a) What is the purpose of trap messages in a network management protocol? List any 3 trap messages of SNMP. 4

b) 6



Consider the wireless topology above, comprised of 6 nodes.

i) When node A transmits to node B, list the potential hidden terminals from A and exposed terminals

ii) What about when node B transmits to node C?

iii) Explain whether using a RTS/CTS protocol will prevent a hidden terminal from clobbering a sender?

iv) When using RTS/CTS, explain how an exposed terminal decides it is safe to send to

another destination?

7a) Consider a reliable stream (i.e., TCP) socket between application processes A and B running on two different hosts. Suppose process A calls send() to send 10,000 bytes of data, and the operating system begins sending the data as a sequence of packets destined to B. If process A calls close() on the socket *before* the operating system finishes transmitting the data, will the remaining data be sent to B? Why or why not? Show the state transitions of TCP during this scenario. 5

b) Consider the following application layer protocols: FTP, SMTP, FTP, POP3, IMAP, HTTP 1.0, HTTP 1.1 and DNS. 5

i) The letter "P" in each acronym denotes what word?
ii) Which protocols are directly related to electronic mail?
iii) Which protocols are stateless?
iv) Which protocols control information "out of band"?
v) Which protocols are generally run over UDP?