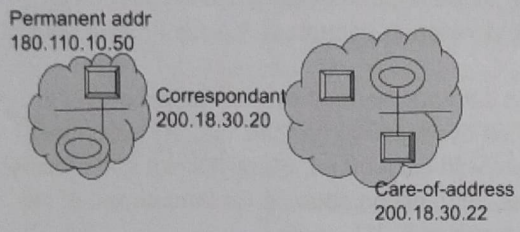
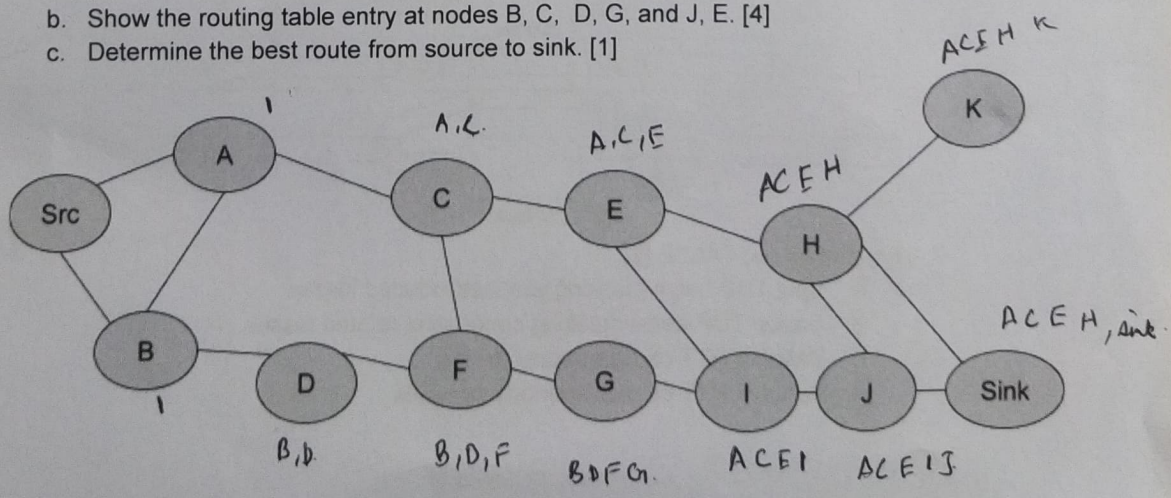
End-semester Examination
Wireless Networks
Full Marks-45
Time-2 hours

1. Consider the movement of a mobile from 180.110.10.50 to 200.18.30.22.

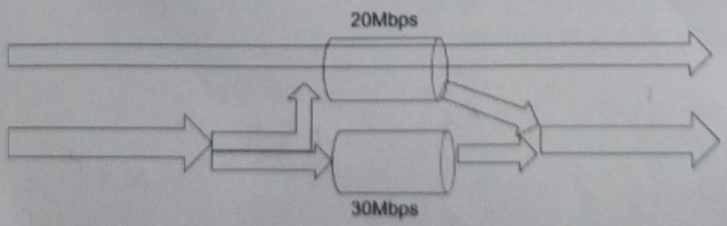


   a. Suppose you are using mobile IP via indirect routing to handle mobility. Show the destination address of a data packet sent by the correspondent. Write the source address of a data packet sent by the mobile. [2]
   b. Suppose you are using mobile IP via direct routing to handle mobility. Show the destination address of a data packet sent by the correspondent. Write the source address of a data packet sent by the mobile. [2]
   c. In this case, which one is more efficient, explain your answer? [2]
   d. Suppose, there is a firewall in the correspondent's network that stops any incoming/outgoing packets whose destination/source address does not belong to the network. Explain whether direct/indirect routing will be impacted by this and explain the reason. [2]

2. Consider the following multihop topology. A link between two nodes means they are in radio range of each other.
   a. Determine the path followed by RREQ and RREP packets for the AODV protocol. [3 +3]
   b. Show the routing table entry at nodes B, C, D, G, and J, E. [4]
   c. Determine the best route from source to sink. [1]



3. In the above network, consider the source wants to send data to the sink at the best possible rate as possible. Note that every node has a half-duplex radio, that can only send or receive (but not both) at a time. Consider the following interference ranges, Src has an interference range of 2. A has an interference range of 2. B, C have an interference range of 3. D has an interference range of 1. E, F, G have an interference range of 4. H, I, J have an interference range of 2. Sink has an interference range of 1
    a. Calculate the maximum transport datarate (/throughput) for Src using Flush protocol when the maximum possible transport datarate is R (your answer should be in terms of R) [3]
    b. Calculate the maximum transport datarate (/throughput) for Src according to PIP protocol. Assume there are 3 non-overlapping channels (i.e., transmissions over these 3 channels won't interfere with each other). Show the slot and channel assignment. Compute the max possible transport datarate (or throughput) of the network (your answer should be in terms of R) [3]
4. In the PIP protocol, will there be any issues if the Teardown message is sent by the source but not by the sink? Explain your reason. [3]
5. Using a separate subflow sequence number for MPTCP causes problems in TSO and in presence of other middleboxes. Can we use dataflow sequence numbers as it is in the subflows, explain your answer? [3]
6. Consider the following network with one TCP flow and one MPTCP flow. The MPTCP flow has two subflows. The MPTCP flow uses EWTCP/coupled congestion control. Remember: for EWTCP for every RTT increase wr by α. For each loss, decrease window wr by wr/2. Coupled TCP congestion control: for each RTT increase wr by wr/wtotal. For each loss, decrease window wr by wtotal/2. Consider the following network, answer the questions when the flows are in the steady state.
    a. How much would be the throughput of the regular TCP flow and MPTCP flow if MPTCP follows EWTCP congestion control? [2+1]
    b. How much would be the throughput of the regular TCP flow and MPTCP flow if MPTCP follows coupled TCP congestion control? [2+1]



7. Tick the one(s) FALSE [2]
    a. Split TCP helps masking wireless induced losses
    b. Snoop TCP helps masking congestion related losses
    c. Variable RTT causes packet losses
    d. Variable RTT causes spurious timeouts

8. Consider the following variation of the SampleRate algorithm, called SampleYara. SampleYara is similar to SampleRate in all aspects except one: while SampleRate sends every 10th packet at a rate that provides lower loss transmission time, SampleYara has an additional constraint that it sends at that rate if a) provides lower loss transmission time b) the diff-time<threshold. Remember the diff time indicates the duration for which backoff timer was frozen due to other transmissions. Consider the threshold is 1000us. Consider a 802.11g wireless link running SampleRate and SampleYara, that can operate at 54, 48, 36, 24, 12, 6 Mbps. [3+ 3]
    a. For destination A, the table shows the transmission time of each rate. Determine what will SampleRate and SampleYara will choose.
    b. For destination B, determine what SampleRate and SampleYara will choose.

Destination	Bitrate	Avg Tx. Time	Lossless Tx. Time	Diff-Time
A	54	3761	1873	800
	48	3000	2000	1200
	36	2950	2300	900
	24	5000	2400	400
	12	8000	8000	400
	6	10000	10000	400
B	54	3000	1873	800
	48	2500	2000	800
	36	2390	2300	1100
	24	2400	2400	800
	12	8000	8000	800
	6	10000	10000	800