In the name of beauty

1st problem set of ComNet course

Q1)

Determine the following statements as true or false with enough reasons.

a- False. This is the definition of propagation delay.

b- Packet Switching is practically more complicated than Circuit Switching while being more suitable to real-time applications.

c- False. Packet switches are also included.

d- False. With traffic intensity being close to 1, the queuing delay of the packets tends to infinity due to packet acumulation in buffer.

e- False. Link-layer switches are typically capable of processing the packets up to the layer 2, unless they are manipulated manually.

f- False. SMTP and FTP are examples of layer 5 (Application Layer) protocols.

Q2)

What is the difference between **Virus** and **Worm**?

Q3)

Consider the following network in which node A wants to send packets to node B through a router and two links: Assume the transmission rate of

the links 1 and 2 to be 100Mbits/sec and 50Mbits/sec, respectively and both of the links be 10km long. The speed of light is 2×10^8m/s in the links.

a-

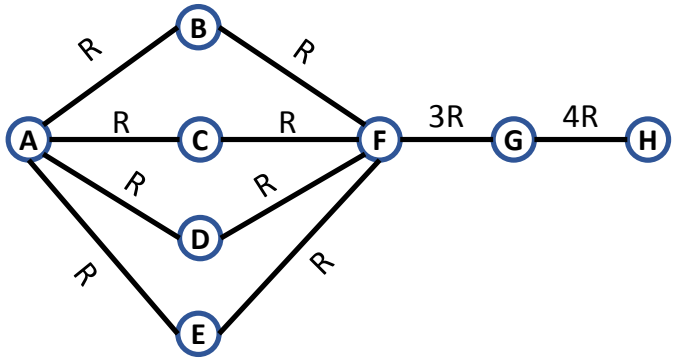
$$\Delta_{\text{Propagation,end-to-end}} = 2\frac{d}{c} = 2 \times \frac{10km}{2 \times 10^5 km/s} = 100\mu sec$$

b- Since each packet is 100Kbits, it would take 1ms and 2ms for each packet to traverse the links 1 and 2 respectively. Since it is assumed for each packet to occupy a full time slot, the time slot duration is 1msec as well. By the end of the first time slot, node 1 has completed the transmission of packet 1 and heads over to hand out the packet 2. By the end of the 1st time slot ($+50\mu$sec propagation delay which is negligible), the intervening router has received packet 1 completely and immediately starts to transmit it on its link 2 interface. Since link 2 has half bit rate compared to that of link 1, the packets will take 2 time slots to pass through the link. Keeping on this track, by the end of the 4rd time slot, packets 2, 3 and 4 are received by the router, packet 1 has left the router and packet 2 is halfway through leaving the router. Hence, we end up with 2.5, yet un-transmitted, packets to be stored. The required amount of buffer capacity would then be $2.5 \times 12.5 = 31.25$ Kbytes.

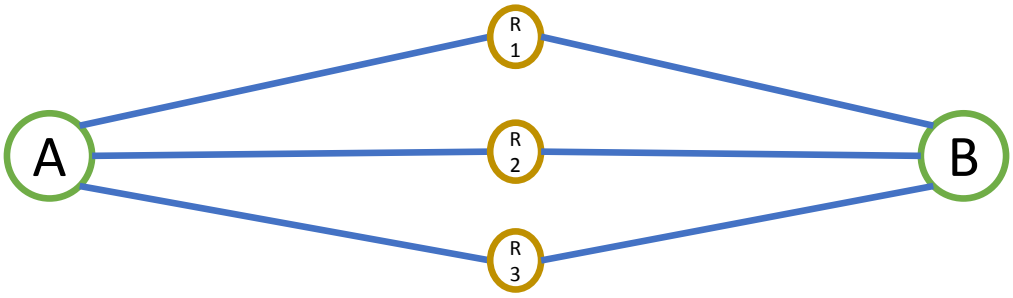
c- Yes. Link 2 is a bottleneck for its bit rate is lower and imposes a traffic intensity of 2 on the system.

Q4) Such a path must contain nodes A-F-G-H and two of the intermediate nodes B,C,D,E. The probability that each of the paths ABF to AEF will work, is equal to $(1-p)^2$. Since we need two of such paths, there is a probability of $\binom{4}{2}(1-p)^4[1-(1-p)^2]^2$ that a throughput of $2R$ is available between nodes A and F. Considering the path F-G-H, the probability that node A can send packets to node H would be

$$\binom{4}{2}(1-p)^6[1-(1-p)^2]^2$$



Q5)



a-

$$1 - (1 - (1 - p)^2)^3$$

b-

$$3(1 - p)^2 R$$