

ENEL 492 Mid Term Exam



1. A communication channel linking two routers operates at 500 kbps. Frame size is 10,000 bits, frame overhead (less sequence number field) is 97 bits, data frames are always available for piggybacking, and τ is 50 ms. The bit error rate (b.e.r.) is 1×10^{-9} and the window size is to be large enough to "fill the pipe".
 - a) Compute the total number of overhead bits which are sent between errors with protocol 5 (on average)
 - b) Compute the total number of overhead bits which are sent between errors with protocol 6 (on average)
 - c) At what b.e.r. will protocol 5 be just as efficient as protocol 6?

2. A 64 kbps satellite channel with $\tau=250$ ms is used to send 800 byte frames. Data frames are always available for piggybacking, frame overhead is negligible, and 3-bit sequence numbers are used. What is the maximum achievable channel efficiency for:
 - a) protocol 4?
 - b) protocol 5?
 - c) protocol 6?
 - d) protocol 5, assuming an average wait of 200 ms for a reverse-bound data frame?

3. For a channel with a bandwidth of 6 MHz:
 - a) What is the maximum rate at which information may be transmitted given a SNR of 30 dB?
 - b) What is the rate at which information may be transmitted if the channel is noiseless and the signal is octary (8-levels)?
 - c) Repeat (b) for a 32-ary signal.

4. In the ISO/OSI model:
 - a) explain how a ~~connectionless~~ ^{oriented} service can be provided to a transport layer given that the underlying subnet is a reliable datagram facility.
 - b) what must change from (a) if the subnet is an **unreliable** datagram facility

5. Company X President requests his VP, Engineering to determine if a new product can be brought to market in 6 months. The VP, Engineering asks the Project Engineer if there are any critical component delivery problems. The Project Engineer contacts a Sales Engineer from a supplier who, in turn, reports the urgent request to

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her VP, Production. The VP, Production contacts the company president for approval to reassign production priorities. The approval is secured, the VP, Production tells the Sales Engineer there will be no problem with deliveries. The Sales Engineer then contacts the Company X VP, Engineering the good news.

- a) Is this an example of a multilayered protocol in the sense of the OSI model?
- b) Explain your reasoning if it is, or
- OR
- c) Explain what would the process have to be if it were to be an example of a multilayered protocol, in the OSI sense.