

Data Communication and Networks

Mid Semester Assignment

Course Code: 102002090

Course Title: Data Communication and Networks

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Program: BS Computer Science

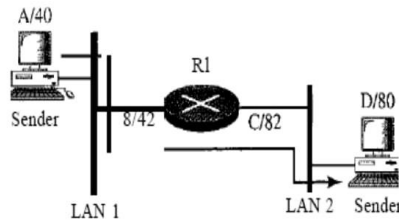
Total Marks: 30 Time Allowed: 48 Hours (2 Days)

Note: Attempt all Questions:

Q.1: Protocol layering can be found in many aspects of our lives such as air travelling. Imagine you make a round-trip to spend some time on vacation at a resort. You need to go through some processes at your city airport before flying. You also need to go through some processes when you arrive at the resort airport. Show the protocol layering for the round trip using some layers such as baggage checking/claiming, boarding/off-boarding, takeoff/landing. (4 marks)

Q.2: Give some advantages and disadvantages of combining the session, presentation, and application layer in the OSI model into one single application layer in the TCP/ IP Protocol Suite (Internet model). (3 marks)

Q.3: In Figure below, assume that the communication is between a process running at computer A with port address m and a process running at computer D with port address n . Show the contents of packets and frames at the network, data link, and transport layer for each hop. (3 marks)



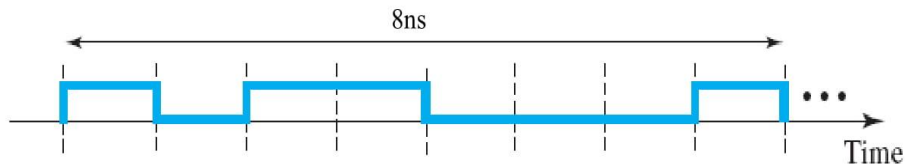
Q.4: What is the theoretical capacity of a channel in each of the following cases: (6 marks)

- Bandwidth: 15 KHz $\text{SNR}_{\text{dB}} = 30$
- Bandwidth: 100 KHz $\text{SNR}_{\text{dB}} = 2$
- Bandwidth: 0.5 MHz $\text{SNR}_{\text{dB}} = 10$

Q.5: A digitized system is operated at 4800 bps. If a signal element encodes an 8-bit word, what is the minimum required bandwidth of the channel? (3 marks)

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Q.6: What is the bit rate for the signal given below? (4 marks)



Q.7: A capacity of the channel is given as 40 Mbps, the bandwidth of the channel is 6 MHz. Assuming white thermal noise, what signal-to-noise ratio is required to achieve this capacity? (3 marks)

Q.8: A composite signal that is non-periodic contains frequencies from 20 to 40 KHz. The peak amplitude is 10 V for the lowest and the highest signals and is 30 V for the 30-KHz signal. Assuming that the amplitudes change gradually from the minimum to the maximum, draw the frequency spectrum. (4 marks)
