

CS-455 HW2 Summer 2023 34 points

Submission instructions

- *Due date: Saturday, June 24, 11:59 pm Central Time (i.e. local time in Chicago)*
- *Late submissions will not be accepted.*
- *Edit your submission. It has to be neat and legible. **Absolutely no handwritten submissions. No credit will be given for handwritten submissions.***
- *Teamwork is allowed (max. 3 students/team). Individual submissions are also OK.*
- *Upload your HW assignment (**pdf format only**) to Blackboard. **Submissions in formats other than pdf will be disregarded.***
- ***One submission per team only.** Type names, A#, and section numbers of all the team members on the front page. Do **not** submit multiple copies of your HW assignment (e.g. by each team member). It is very confusing and will be penalized.*

Show your work and explain all your solutions for full credit.

1. (2 points) What is the carrier signal? Explain its role in the analog transmission.
2. (3 points) Consider a low-pass channel with the carrier frequency of 15 kHz. What is the BASK bit rate if $d=0.5$?
3. Calculate the baud rate for the given bit rate and type of modulation:
 - a. (2 points) 3000 bps, BFSK
 - b. (2 points) 50 kbps, BASK
 - c. (2 points) 60 kbps, 16-QAM
 - d. (2 points) 9000 bps, QPSK
4. (3 points) The constellation diagram has two points whose coordinates are (2, 0) and (8, 0). What modulation does this diagram present? What is the interpretation of these coordinates?
5. (2 points) How is a channel related to a link?
6. (2 points) Why is a filter needed in the FDM demultiplexing process?

7. (2 points) We would like to digitize a certain analog signal using 5 bits per sample. The lowest frequency of this signal is 100 kHz and its bandwidth is 200 kHz. What is the bit rate?
8. (2 points) Can packets in a datagram network arrive at their destination out of order? If so, why?
9. (3 points) What are the basic differences between circuit switching and datagram switching?
10. (2 points) Explain the function of a dial-up modem.
11. (3 points) The FHSS technique with 16 different carrier frequencies is used to create a communication channel for a certain sender-receiver pair. The resulting expanded bandwidth is B_1 . We have to increase the number of the sender-receiver pairs from 1 to 8. What is the resulting expanded bandwidth B_2 ?
12. (2 points) Explain why ADSL is asymmetric.