BIMU 3066 - Data Communications – Final

Academic Year / Term	2020-2021 / Fall
Date	18.01.2021
Duration	11:10 – 12:25 (**60 min exam**+15 min submission)

INSTRUCTIONS

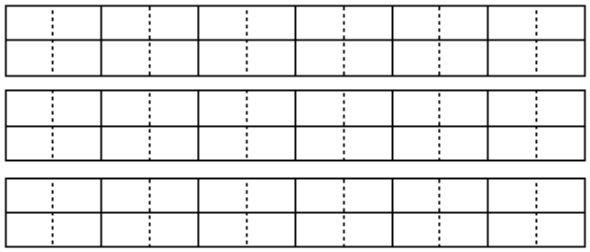
1. You should use blank white A4 papers to answer your questions.
2. You MUST write down the **exam name, date, your student number and your name-surname** at the **beginning (top) of the first page** of your papers. YOU ALSO SHOULD SIGN this paper.
3. After writing down your answers, you should take full size readable photos of your papers and convert them to **a SINGLE PDF document** in correct page ORDER.
4. Please also DO NOT FORGET to **NUMBER your pages in (x of y) or (x/y)** format.
5. You should name your file as **"YourStudentID_YourNameSurname.PDF"**
6. Submit your document UNDER **exam** named "**BIMU3066-Final"** on MERGEN. No submissions on AKSiS or Assignments/Ödevler menu.
7. **NO SUBMISSIONS VIA E-MAIL WILL BE ACCEPTED.**

1. (20p) Draw the signal sketch of the data stream of 11100000000000 for the following scrambling schmes. Assume that the last non-zero signal level has been positive.The number of nonzero pules is odd after the last substitution (for HDB3)

    a. B8ZS
    b. HDB3 (The number of nonzero pules is odd after the last substitution)

2. (15p) Assume that you want to sample an analog signal using PCM and send it via a channel of 30 kbps. If the bandwidth of the analog signal is 20 KHz, what's the amount of quantization error in decibels?

3. (15p) Sketch the waveforms of 110101 stream with ASK, BFSK and BPSK. Use a guide table similar to following and sketch three of them together, one scheme in each row.



4. (24p) Assume that we want to multiplex ten sources with multilevel TDM. Six of the sources have a bit rate of 400 kbps and four of them have a bit rate of 800 kbps. Assume that the interleaved unit is 1 bit and you use no extra (synchronizing) bits.

    a) What is the size of a frame in bits?
    b) What is the frame rate?
    c) What is the duration of a frame?
    d) What is the output data rate?

5. (10p) Find the minimum bandwidth of a FDM system which multiplex five devices, each requiring 4000 Hz. 200 Hz of guard band is needed for each device.

6. (8p) a) What is the main aim of spreading the spectrum? Explain the FHSS and DSSS techniques, including the differences between them.

    (8p) b) How CDMA differs from FDMA and TDMA? Briefly explain the mechanisms and advantages of CDMA.

Good Luck.