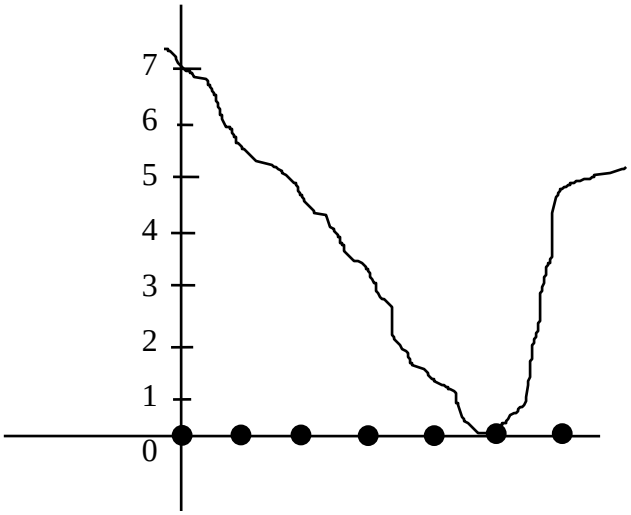
1. 1. On the following figure the decisional values (0-7) of a quantiser are given.
a.) Draw the output of the quantiser for the drawn voice, if the samples are taken at the points marked by black circles, and the quantised (output) values are always in the middle of the decisional intervals!
b.) Can you give a modified characteristic that is better for noise suppression at low input values?
c.) Can you give a modified characteristic that has less decisional intervals but whose precision will be the same for the human's ear?



2. Describe the steps of the voice digitalisation
3. Describe the European (30+2 channel) PCM frame/multiframe system!
4. Describe the American (24 channel) PCM frame/multiframe system!
5. Draw the structure of the telephony network (with the international and metropolitan networks)!
6. What are the open and closed numbering schemes? Compare them!
7. Draw the concept of the dial-up internet access! What is the maximal bit speed?
8. Desrcibe the frequency allocation of an ADSL connection!
9. Draw the ADSL topology!
10. What is the „Triple Play" service? How can it be reached through an ADSL connection? (Figure!)
11. What is a CATV system? Is it suitable for Internet access? (Why or why not?)
12. How can the cable TV be used for Internet access? Can we guarantee the bandwidth (Why or why not?)
13. What is the concept of the NGN?

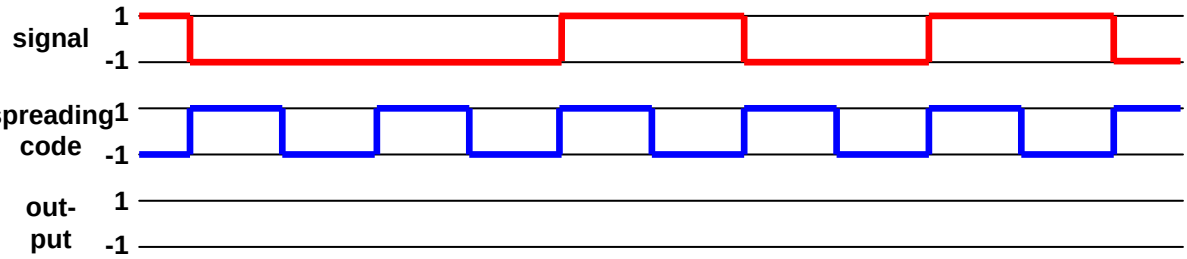
14. What is the cellular concept? What are the advantages and disadvantages of the small cells?

15. How wide is a band and a carrier in GSM and in UMTS? How many time slots are in a carrier in GSM?

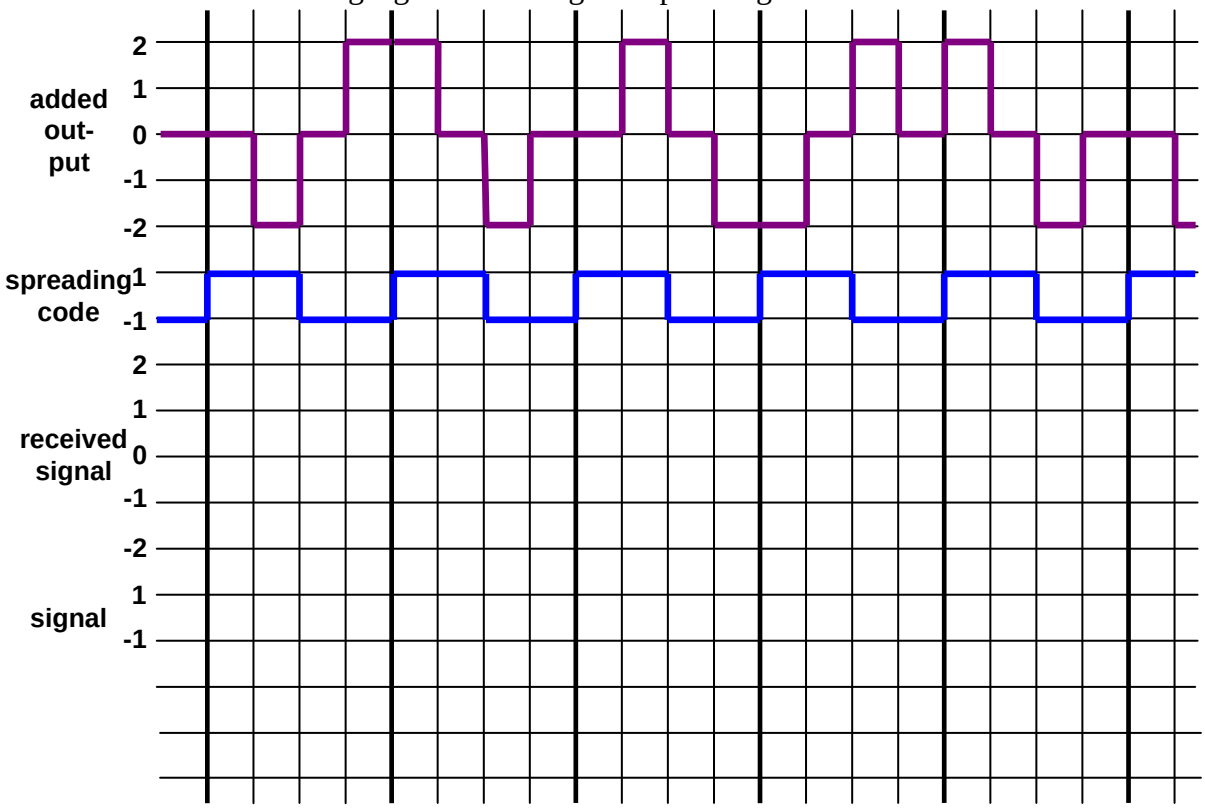
16. Draw the structure of the GSM network!

17. Draw the structure of the GPRS network!

18. Encode the following signal with the given spreading code!



19. Decode the following signal with the given spreading code!



20. Draw the structure of the UMTS network!

21. What is a hard and soft handover? (Descrption, advantages, disadvantages)

22. Why is it so important to control the power of the UEs in the UMTS networks? Describe the process!

23. Describe the power control process at soft handover!

24. Describe the functionality of an analogue interface card (BORSCHT)

25. Draw the block diagram of a digital switch!

26. Draw the internal structure of an S switch! How does it work?

27. Draw the internal structure of a T switch! How does it work?

28. Draw the block diagram of a TST switch! Explain, how it works!

29. Describe the DTMF signalling!

30. What is the task of the LAPD protocol? What are the frame types used in LAPD? What are the different frames used for?

31. How can a call be established with DSS1? (Message sequence)

32. What is the common channel signalling concept? (Description, advantages, disadvantages)

33. Draw the SS7 protocol stack! Explain the tasks of the different protocols briefly!

34. Describe the tasks of the 3 levels of MTP!

35. Draw the ISUP signal sequence of a successful call setup and release!

36. Draw the DSS1-ISUP-DSS1 signal sequence of a successful call setup and release!

37. What are the protocols used in the mobile core network (NSS)? Describe them briefly!

38. Describe the functionality of the SCCP!

39. What are the most important identifiers in GSM? (Name, purpose, internal structure)

40. What are the protocols used at the A interface?

41. What are the steps of a mobile originated call at the A interface?

42. What are the steps of a mobile terminated call at the A interface?

43. What are the steps of a mobile terminated call in the NSS?

44. Describe the process of Location Update!

45. Describe the Short Message Service! How an SMS is sent and delivered?

46. Describe the steps of the Authentication in mobile networks! (theoretical and practical solutions)

47. How does the GSM support user confidentality?

48. What is a location area? For which purposes is it used?