

Mobile Communication Networks

Revision questions I

1. What is the relationship between the wavelength and frequency of a sine wave?
2. What is the relationship between a signal's spectrum and its bandwidth?
3. Which parameters of an electromagnetic wave (represented by a sin function) can be modulated in order to carry information?
4. Define channel capacity.
5. Which key factors affect the channel capacity of a communication channel?
6. What is the definition of *Spectral Efficiency*?
7. What are the two main functions that are performed by an antenna?
8. What is an isotropic antenna?
9. What is the definition of antenna gain?
10. Explain the statement: "*The antenna has a gain of 10 dBi.*"
11. What information is available from a radiation pattern?
12. Why is the knowledge of signal wavelength important for the design of antennas?
13. What is the advantage of a parabolic reflective antenna?
14. What is (signal) attenuation?
15. What is the primary cause of signal loss in satellite communications?
16. How is radio propagation on land different from that in free space?

17. What is refraction?
18. What is the difference between diffraction and scattering?
19. What is a path loss exponent?
20. A Mobile station is not in the direct line of sight of a Base station. How is the signal received? Explain.
21. How is the received signal affected by multipath propagation?
22. Explain, in your own words, the distinction between average path loss, shadow fading, and multipath fading. How are they related to one another?
23. What is the difference between fast fading and slow fading?
24. What is the difference between flat and frequency selective fading?
25. Path loss, fading, and delay spread are the three most important radio propagation issues. Explain why those issues are important in a cellular system.
26. What is intersymbol interference (ISI)? What causes intersymbol interference? Does it affect the transmission rate of a digital channel? How can you reduce intersymbol interference in the wireless communication system? Explain clearly.
27. How are binary values represented in amplitude shift keying, and what is the limitation of the approach (suggestion: think of multilevel ASK)?
28. Think of a phase diagram and the points representing bit patterns for a PSK scheme. How can a receiver decide which bit pattern was originally sent when a received 'point' lies somewhere in between other points in the diagram? Why is it, thus, difficult to code more and more bits per phase shift?
29. Why is it advantageous to have neighboring points in a phase diagram differ by just one bit?
30. What is differential encoding (e.g., DPSK)?
31. What is Quadrature Amplitude Modulation (QAM)?
32. Why is QAM called that way? (hint: check its operation principle)

33. Why is demodulation of BPSK more challenging (demanding coherent demodulation) than the demodulation of ASK? What precise information does the receiver needs? Why is the demodulation of DBPSK simpler than the one of BPSK?
34. Increasing the amount of amplitude levels and phase shifts, we can gain higher level xQAM, such as 64QAM and 256QAM. It seems the transmission rate can be as high as we want by using this kind of modulation. Is that true? Explain briefly.