1. Elements of the telelphony network (PSTN). Voice channel, PCM modulation. Why is dial-up slow, how is that changed in xDSL?
2. Frequency allocation for ADSL. Why is it asymmetric? What is the role of an ADSL modem, a splitter, a DSLAM?
3. Properties of ADSL2 – complete digital mode, SRA. Chagig of the frequency domain in ADSL2+ – what are the consequences? The same for VDSL. What is the typical way of using VDSL? What is the main novelty of VDSL2? What does „triple play" mean?
4. Why do we need also symmetric access network technologies? Application examples. How can this be supported with xDSL?
5. G.fast novelties – frequency domain, TDD, power efficiency.
6. Networking basic principles. Multiple Access (TDMA, FDMA, CDMA) vs. Multiplexing (TDM, FDM, CDM) vs. Duplexing (TDD, FDD). Contention-based channel access.
7. What is the difference between providing TV service or boradband internet service over a cable network? What is the role of a fiber node? Spectrum allocation between TV, radio, upstream and downstream internet service – why in this way?
8. What is Telco return in DOCSIS 1.0? QoS support in 1.1: why, how? How is speed increased in later versions (S-CDMA, channel bonding, OFDM)?
9. What is ranging, and why we need it? Contention-based upstream in cable networks – FDD/TDMA. Uplink slot request strategies to support different QoS classes (CBR – UGS, rtVBR – RTPS, UGS-AD, nrt-VBR – nRTPS, BEG). How is the handling of downstream traffic different? In summary, why is boradband over cable asymmetric (number of channels, modulation, contention-based upstream)
10. Aloha vs. Slotted Aloha. CSMA/CD basics – sensing the channel, slot time, collision detection. Ethernet frame size – why minimum and maximum size? Padding and carrier extension.
11. Difference between a hub and a switch. Collision domain. STP protocol operation.
12. Multi-mode vs. single mode fiber. FTTH architectures – PON, active node, hybrid. ATM cells, SAR. Advantages and drawbacks of ATM compared to Ethernet.
13. IPv4 addresses. Basic terms: network ID, host ID, prefix, netmask. Classful IP addressing. Subnetting. CIDR. Aggregation of routing table entries. Longest prefix match.
14. IPv6 addresses – scoping (link, site, global). IPv6 mandatory fix header. Role of the flow label. Extension headers, chaining. Transition to IPv6 – dual stack, tunneling, translation – basic principles, no need to memorize the names of the different solutions like 6to4 or SITT.
15. Routing basic principles. Routing table, capacity, metrics, semantics. Static vs. dynamic routing. Single path vs. multipath. Flat vs. hierarchical. Inter-domain vs. intra-domain. Hop-by-hop vs. source routing.
16. Distance vector routing – basic principle of operation. Bellman-Ford algorithm. What does a RIP router store, and what does it advertise? Counting to infinity and solutions for it.
17. Link state protocols, LS database. Operation of the Dijkstra protocol.
18. IGP vs EGP protocols. Basic principles of the BGP protocol.
19. Multicast application examples. Multicast vs. unicast reliability. Basic principles of network layer multicast. Multicast scoping. Role and operation of the IGMP protocol. MOSPF. DVMRP.
20. Basic principle of the PIM-SM protocol – shared tree. Basic idea of the SSM model – (S,G) multicast channel, source-specific tree. What does source filtering mean, why do we need it?
21. Advantages and drawbacks of IP multicast – economic and technical.
22. Basic principle of Xcast

23. Basic principle of Application Layer Multicast. Difference between mesh-first and tree-first protocols.
24. Basic principles of UDP. To what kind of applications it is used? What happens if checksum wrong? UDP and fragmentation – how and why?
25. Basic principles of TCP. Acknowledgements. Difference between sequence number and ack number. Building a TCP connection. Difference between Stop-and-wait and the TCP flow control. Role of the advertised window size. How to handle a fast sender? Sliding window.