Final examination syllabus 2020-21. – Telecommunication informatics

Electrical engineering, Communication engineering E

Infocommunication networks

Philosophy of open systems interconnection, theory of layer models.

Types of physical media: guided (copper, fiber), unguided (radio waves) and applications. Physical media, measuring basics (attenuation, crosstalk, bit error rate, jitter).

Communication processes of physical layer: multiplexing methods (FDM, OFDM, WDM, TDM, STDM, CDMA).

Communication processes of physical layer: digital modulations: baseband transmission (line codes, clock recovery, bandwith efficiency, scrambling), passband transmission single and multi-carrier modulation).

Communication networks in physical layer: digital subscriber lines (xDSL), cable TV (DOCSIS), fiber to the home (FTTx, GPON).

Datalink layer communication techniques. Frame types, frame assembly, frame synchronizing. Error handling processes, error correction codes, error detection strategies. Cyclic redundancy check (CRC) methods and efficiencies. Bit Error Rate (BER), frame error rate, error statistics. Traffic engineering (error and flow control) in the datalink layer protocols. Sliding window protocols. HDLC and PPP frames and their applications.

Protocols of the network layer, theory of IP (Internet Protocol) routing. Packet structure of IPv4 and IPv6 protocols, cooperation with datalink layer (ARP- Address Resolution Protocol, DHCP - Dynamic Host Configuration Protocol, ICMP - Internet Control Message Protocol).

Theory of IP Quality of Service (QoS), implementations. Integrated Services, Differentiated Services, traffic shaping, traffic policing. IP multicast theory and applications.

Transport layer protocols. TCP/IP protocol stack (Transmission Control Protocol, User Datagram Protocol). Security concerns of network communication, encryption, authentication and authorization. Firewalls and Virtual Private Networks.

Application layer protocols. Domain Name System, Domain Name Service. Meanings of different DNS records (SRV, MX). Hypertext Transfer Protocol (HTTP) and Secure HTTP (HTTPS).

IP-based media transfer. Voice over IP systems, SIP (Session Initiation Protocol).

Dr. Gyányi Sándor, Gudra Tibor

Final examination syllabus 2020-21. – Telecommunication informatics

Electrical engineering, Communication engineering E

Telecommunication II.

Spectral Description of Signals, Fourier Analysis;

Time, frequency and complex frequency domains, and network description functions (pulse response, transmission characteristic, ideal low pass filter, conditions of linear distortion, transfer function, interpretation of zeros and poles, criteria of network stability);

Amplitude modulation (AM signal in time and frequency domain, multiplier modulator and demodulator, principle of QAM, block diagram of QAM transceiver);

Angle Modulators (FM signal in time and frequency domain, modulators, demodulators);

Principles of sampling (block diagram, PAM signal spectrum, Shannon's theorem, aliasing phenomenon, sampled signal recovery, quantization, quantization noise);

Time and frequency domain description of discrete time systems (weight function, discrete convolution, discrete Laplace transformation, transformation of Z series, transfer function, criteria of stability);

Basic DSP structures (FIR structure, IIR structure, over-sampling, principle of interpolation and decimation, principle of predictive encoders);

Digital modulation systems (baseband modulation systems, ISI free channel, Nyquist criterion,

Principles of Multiplex Systems (FDM, TDM, WDM, CDMA, OFDM).

Dr. Vámos Péter, Dr Wührl Tibor

Final examination syllabus 2020-21. – Telecommunication informatics

Electrical engineering, Communication engineering E

Telecommunication informatics

Ideas: Information, data, information techniques, telecommunication networks, multimedia, infocommunication. Types of infocommunication networks, its main characteristics, development directions.

Basic ideas of data transmission. Basic thesis (Shannon, Nyquist). Duplex/halfduplex/simplex transmission. Basic characteristics of synchronous and asynchronous data transmission. Connection between data transfer speed and symbol speed. Circuit, packet and message switching. Network topologies.

Questions and necessity of standardization. Standardization organizations. Idea of network architecture. Idea and main properties of protocol.

ISO OSI reference model. Interpretation of opening. Elements of OSI: protocol, entity, connection. Layers and properties of OSI layers. Protocol functions. Connectivity between layers, idea of interface. Service primitives. Protocol data units (PCI, PDU, SDU). Evaluation of OSI model.

Growing-up TCP/IP. Main properties of TCP/IP layers. Evaluation of OSI model. Comparing OSI and TCP/IP. The hybrid model.

Physical medium: Twisted pair, coaxial cable, optical cable, wireless transmission, microwave and satellite transmission.

Baseband transmission. Coding procedures (RZ, NRZ, AMI, Manchester, Diff. Manchester, HDB3, 2B1Q, 4B3T). Effects of noise and limited band for data transmission speed. Subscriber lines. Copper access technologies: ADSL, HDSL and VDSL

Serial transmission: PC serial port (RS 232C). Architecture of Universal Serial Bus (USB) and its application area.

Data link protocols: Tasks of data link layer: error control, separating data units, flow control.

Character and bit oriented procedures. Structures of blocks and frames. Transparency and control.

Media access sublayer: problem of media access. Static and dynamic access, Multiple access procedures: CSMA/CD, CSMA/CA. Ethernet. Token Ring. Wireless LAN-s. Bluetooth.

Network layer: Main properties of network layer. Connecting networks. Connectionless and connection based network services. Network layer of TCP/IP: IPv4, IPv6. IPv4 - IPv6 cooperating modes. ICMP, IGMP, ARP, RARP, BOOTP, DHCP.

Network hierarchy, routing. Routing algorithm (Static routing, Dynamic routing). Distance Vector (DV) routing, Link State (LS) routing, Open Shortest Path First (OSPF), Policy routing).

QoS on IP networks. Traffic forming. Ensuring QoS (DiffServ, IntServ, MPLS).

Final examination syllabus 2020-21. – Telecommunication informatics

Electrical engineering, Communication engineering E

Main properties and tasks of transport layer. Transport service primitives. Ports and sockets. Transport protocols of TCP/IP (TCP, UDP).

Application layer: Telnet, ftp, smtp, pop3, imap dns, wins, ssh. Web technologies (URL, http, https, HTML. XML, XHTML.

Client-server architectures. Partitioning applications, two-tyre C/S architecture, three-tyre C/S architecture, web architecture.

Multimedia: Quality of service. Protocol stack. Voice coding, H323. SIP. Possible scenarios.

Basic ideas and problems of Cryptography. Cryptography model. Classical methods. Symmetrical and asymmetrical cryptography. Digital signature. PKI. Steganography.

IPsec: security services and methods. VPN problem (Leased lines, private networks, Internet.) General VPN conception. VPN solutions

Component achieving of border protection. Types of firewalls. Operation component ad problems of NAT.

Dr. Beinschróth József