

Thematic Topics for the Bachelor Final State Exam

Bachelor study program Communication, Multimedia and Electronics

Common Theoretical Part

1. Limit and derivation of a function, Taylor series, behaviour of functions, integration of functions. Definite integral, applications. Improper integral. Differential equations. Convergence of series. (A2B01ZMA)
2. Systems of linear equations, linear spaces. Linear mappings and their matrices. Matrices and determinants. Scalar product. Eigenvalues and eigenvectors. Laplace transform. (A2B01LAA)
3. Functions of more variables. Limit, derivative, gradient, Jacobi matrix. Double and triple integral. Path and surface integral. Gauss, Green and Stokes theorem. (A2B01MA3)
4. Functions of complex variables. Cauchy-Riemann equations. Holomorphic functions. Path integral. Cauchy integral theorem. Series of functions, power series. Laurant and Fourier series. Residue theorem. (A2B99MAA)
5. Kinematics, Newton's laws, work, power and energy. Mechanical oscillating systems, resonance. Conservation of linear momentum and conservation of energy laws. Quantum mechanics. Special theory of relativity (A2B02FY1).
6. Kinetic theory of gases, mechanics of fluids. Thermodynamics. Huygen's principle. Doppler's effect, wave equation. Optics (geometrical and wave). Photometry. Polarization, dispersion. Nuclear physics. (A2B02FY2)
7. Electrostatic and stationary field, potential, voltage, energy and forces, superposition. Capacitance, inductance, boundary between materials, work, energy and forces in electromagnetic field, (A2B17EPV)
8. Harmonic electromagnetic wave, wave equation, wave on boundary between materials, Pointing's theorem. Parameters of a transmission line, transmission, reflection, impedance, Smith chart (A2B17EPV)
9. Properties of semiconductors and semiconductor structures (P-N junction, Metal Semiconductor junction, heterojunctions, Metal Insulator Semiconductor structure), passive electronic devices (structures, properties, models and applications). (AE2B34ELP)
10. Active electronic devices (transistors MOSFET, BJT, JFET), power semiconductor devices, optoelectronic devices, logical gates and memories - principles, structures, characteristics, models and applications. (AE2B34ELP)
11. Time and frequency representation of signals, classification of signals and systems, basic theorems, correlation, second order statistics. (AE2B99SAS)
12. Pass-band signals, complex envelope, discrete Hilbert transform, sampling and interpolation, types of analogue and digital modulations, intermodulation. (AE2B99SAS)
13. Basic laws and theorems. Kirchhoff's circuit laws. Elementary and general methods of electrical circuit analysis - nodal-voltage analysis, mesh (loop) analysis. Thévenin's and Norton's theorem. (AE2B31ZEO)
14. Sinusoidal steady state analysis. Phasors. Resonant circuits. Transient analysis. Frequency response of elementary circuits, asymptotic approximation. (AE2B31ZEO)
15. Devices measuring electric current, voltage and power, frequency and phase difference and basic parameters of passive elements (resistance, inductivity, capacity). Device errors and measurement uncertainty. AD and DA convertors. Multimeters, oscilloscopes. (A2B38EMB)
16. Combinational circuits, sequential circuits, functions, description, examples of realization, design methodology. Programmable logic circuits, gate arrays, VHDL, application of microprogrammable machine and microprocessor system in logic functions. (A2B99DIT)
17. Amplifiers with transistors and operational amplifiers (linear, nonlinear, selective), using and properties of feedback. Circuits for signal generation - monostable trigger circuits and multivibrator, oscillators, operating principle of phase locked loop. (AE2B31ANO)
18. Properties of materials for electrical engineering, nanotechnology, transformers, rectifiers, generators, electric engines, Power engineering. Transmission and distribution of electric energy. Power plants. (A2B13PEL)

Common Professional Part

1. Layered models of data communication, various network topologies, LAN networks, various protocol examples in TCP/IP architecture. (A2B32DAT)
2. WAN networks, Internet architecture, IPv4 addressing, routing protocols, IP multicasting. (A2B32DAT)
3. Radiocommunication link, parameters of antennas and transmission, spherical wave, Friis formula, geometric optics, Huygens principle, Fresnel zones, reflection, scattering, refraction, diffraction (A2B17PMS)
4. Propagation of wave in atmosphere, empiric and deterministic models. Directional and satellite links, mobile links, propagation in urban area and inside buildings, planning of cell nets. (A2B17PMS)
5. Phenomenon as well as principles (physical, electronic and optoelectronic) using in sensors, MEMS and microactuators, parameters, sensor data processing, smart sensors (AE2B34SEI)
6. Sensors and actuators for quantities (mechanical, optical, thermal, magnetic, chemical). Working principles, structures, electronic circuits, properties. (AE2B34SEI)
7. Shannon communication chain, Information capacity of channel, Channel coding, Digital modulation, Multiplexing, Access methods, Radio communication chain blocks. (A2B99KOS)
8. Telecommunication line modelling, Chanel with noise and crosstalk, Functional blocs of modems, Digital interface parameters, Jitter and wander. (A2B99KOS)
9. Physiology and anatomy of vision. Image sensing and reproduction. Source coding of image information and video transmission systems. Digital photography, pre-processing methods. (A2B37MMT)
10. Physiology and anatomy of hearing. Electroacoustic transducers. Signal processing, recording and source coding of sound. Measuring methods in acoustics. (A2B37MMT)
11. Algorithm, programs and languages, Syntax, Basics of program language C++. (A2B77PR1)
12. Running program control, Program branching, Cycles, Procedures a functions, Structure of program, Principles of modular and object programming. (A2B77PR1)

Branch Thematic Topics

Branch Network and Information Technologies

1. Transmission of digital voice, switching systems, signaling, ISDN, NGN, ATM, VoIP. (A2B32TSI)
2. Digital hierarchies - PDH, SDH, OTH, basic principles of mobile networks, access networks, xDSL, wireless access networks. (A2B32TSI)
3. Background of geometric and wave optics, propagation of a ray in non-homogeneous medium, modal structure, Gauss beams, transmission through optical elements, absorption and dispersion, propagation of pulses in a dispersive medium. (A2B17OKS)
4. Transmission properties of optical fibers and their measurement, optical transmitter and receiver, direct and coherent detection, optical systems in free space - FSO. (A2B17OKS)
5. Network documentation, administration principles and license management, User management. (A2B99SOS)
6. File system administration, LINUX and Windows configuration, Network administration, File system backup, Risk management and network security. (A2B99SOS)
7. Principles of telecommunication network planning and design, Conception and operation of telecommunication network, Telecommunication services and legislation. (A2B32PPS)
8. Management and planning of telecommunication provider, Telecommunication services and equipments business, Government and regulation of telecommunication sector. (A2B32PPS)