

State Examination Questions for Master Study FEL ZČU year 2016/2017 field EI

File contents questions and categories from three subjects of the State Examination field Electronics and Informatics (EI):

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| KAE/SNESE | Electronic parts and systems |
| KAE/SNPPE | Computers and programming in electronics |
| KAE/SNPZS | Signal transmission and processing |

KAE/SNESE Electronic parts and systems

1. Feedback in electronic circuits. Stability. Feedback influence on frequency plot, gain, input and output impedance.
2. Operational amplifiers. Basic parts – differential amplifier, current mirror, and so on. Frequency response correction. Discussion of real amplifier abilities, discussion of possible imprecisions. Current feedback amplifiers, instrumental amplifiers, galvanic barrier amplifiers.
3. Power amplifiers, class AB and D.
4. Noise in analogue systems, noise voltages of components - resistors, semiconductors, calculations.
5. Oscillations generation, relaxing and harmonic. Oscillators LC and crystal. Generators rectangular saw tooth and triangular shapes. Conversion V/f a f/V .
6. Functional circuitry: precise limiters, multipliers, logarithmic and exponential amplifiers, on so on.
7. Precise switches circuitry. Multiplexors, sample and hold circuits, switching capacitor circuitry with OpAmps.
8. A to D and D to A converters. Principles, errors. Voltage, Current reference supplies.
9. Active filters. Filter transfer functions. Filter implementation – Salen-Key, universal filter, synthetic part, filters with switching capacitors. Transformation $1/p$. Impedance converters,
10. Phase lock loop: transfer, static and dynamic properties, capture, lock. Phase detectors. Full digital PLL. PLL applications- frequency synthesizer and so on.
11. Combinatorial circuits. Features, minimisation, design methods, way of implementation. Transition phenomena – delays and hazards.
12. Sequential circuits. Description, design methods, internal codes. Synchronous and asynchronous automaton. Timing issues in sequential circuitry, metastability. Synchronisation impulse distribution for synchronous circuits.
13. Asynchronous automaton. Chained structures, principles "request-acknowledge".
14. Timing circuits synchronous and asynchronous. Circuit delay utilization.
15. Memory circuits and systems. RAM memories – static and dynamic. EEPROM and FLASH memories, Special types of memories - FIFO, dual port memory.
16. Computer simulation of analogue circuits. PSPICE - components, analysis, credibility of the results.
17. Diagnostics of digital systems, basic terms, error models, diagnostics type
18. Methods of test generation for combinatorial circuitry and sequential circuitry
19. Methods of design for diagnostics

20. Basics of reliability theory, basic terms and definitions, reliability indicators, tests of reliability
21. Methods and forms of redundancy
22. Basic configurations of power circuits of switching power supplies, which are not galvanically separated from supply system, their attributes and utilization.
23. Basic configurations of power circuits of mains power supplies. Its attributes and utilization.
24. Comparison of linear and switching regulators features for use in power supplies.
25. Main parts of linear and switching regulator and its behaviour.
26. Basic configurations of power circuits of DC/AC converters.
27. Basic interference couplings. Symmetric and asymmetric interfering voltage. Galvanic disturbing influences, capacitive disturbing influences, inductive disturbing influences, irradiation disturbances.
28. Anti-interference devices, filter noise attenuation, anti-interference capacitor (ideal, real, class X, Y), anti-interference inductor (ideal, real, compensated, ferristors), anti-interference LC filters (power net filters, data filters).
29. Measurement of electromagnetic interference. Basic measurement methods related to area of disturbances. Electromagnetic resistivity tests.
30. Arrangements for increasing of electromagnetic resistivity of the devices. General rules for EMC design.

KAE/SNPPE Computers and programming in electronics

1. Microprocessors, main parts, functions. Addressing of external circuits, architecture Von Neumann a Harvard. Type of instructions and its time diagram. Machine cycles, timing.
2. Interrupts. Vectors. Sources of interrupts internal and external, masking a no masking. Utilization.
3. Microcomputers. Address, data and control bus. Bus controller, bus timing, internal and external buses. Peripheral circuits of microcomputers, parallel and serial inputs/outputs. DMA. Counters timers. Diagnostic timers and other diagnostic devices. Analogue inputs/outputs, PWM outputs.
4. Programming of microcomputers. \Modes of addressing, typical directives of assembler, segmentation, code linking, debugging. Interrupt utilization. Programming in C.
5. Architecture and function of programmable circuits CPLD type.
6. Architecture and function of programmable circuits FPGA type.
7. Realization of combinatorial and sequential circuits in VHDL language.

KAE/SNPZS Signal transmittion and processing

1. Web Topologies, Reference model ISO/OSI, Methods of bus access
2. Serial transmitter, synchronous a asynchronous transmissions, principles (RIS)
3. Interfaces RS232, RS485 – basic features, utilization (RIS)
4. CAN bus, basic features, way of coding, way of bus access, frame types, formats of each frame (RIS)
5. LIN bus, basic features, net structure LIN, way of data transfer, message format LIN (RIS)

6. Ethernet, basic features, physical layer, access method, frame types (RIS)
7. USB – basic features, way of data transfer, format and packet types (RIS)
8. Sensor definition, generations of sensors, division according to transduced quantity, intelligent sensors – structure, advantages
9. Temperature sensors, by contact, contactless. Temperature measurements in industry.
10. Force sensors, pressure, torque - types, features and rendition of sensors. Speed sensors, angle speed, acceleration, accelerometers, spirit level
11. Liquid flow rate measurements, volume and mass flow rate devices, surface level measurements
12. Description and features of discrete LTI systems, LTI systems description in time domain
13. LTI systems description in frequency domain, frequency response of the system, system function, transformation from time – frequency – time domain, Z-transformation
14. Sampling, sampling theorem, aliasing, quantization, coding, computer data representation, rounding truncating effects on calculations
15. Allocation, features and design methods of digital filters NRDF and RDF, utilization and influence of windowing methods on features of NRDF filters, filter structures
16. DFT, FFT, features, utilization, decimation in time, decimation in frequency, spectral analysis

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