

## **FINAL EXAM TOPICS**

(Electrical Engineering BSc Program)

- for the students from 2019. subject curriculum;
- and for those EE BSc students who do not have a Neptun signature and grade on TTFBS1200 (TTFBS1200\_L) Electrical Engineering Fundamentals Exam subject.

### **Specialization subject** (Industrial Process Control Specialization)

#### **INDUSTRIAL PROCESS CONTROL:**

1. Functional units, system structure of PLCs, PLC architectures (generations), CPU parts, memories. PLC program execution modes. Cycle time.
2. Classification, brief description, main parameters of PLC IO units. Structure, operation principles of digital input and output modules.
3. PLC selection viewpoints: hardware selection, problems of system performance, environmental conditions, PLC manufacturers' requirements.
4. PLC programming languages and their peculiarities according IEC 61131-3 standard. Standard data types, operations, functions, function blocks.

#### **SMART SENSOR AND MEASURE SYSTEMS:**

5. Analogue to digital conversion. Type of converters, summary and comparing of converters.
6. Application characteristic and functionality of analogue input of multifunctional data acquisition equipment.
7. Application characteristic and functionality of analogue output of multifunctional data acquisition equipment.
8. Methods and tools of temperature measurement.
9. Devices and properties of pressure measurement.
10. Types and application of flow sensors.

#### **ELECTRICAL MACHINES AND DRIVES:**

11. Transformer: principle of operation, construction, equivalent circuit, losses in the transformer, concept of drop, conditions of parallel connection. Construction and configurations of three phase transformers.
12. Commutator (DC) machines: principle of operation, construction, expressions of torque and armature (induced) voltage, equivalent circuit, torque-angular velocity curve of constant pole flux motor, DC series (universal) motor.
13. Synchronous machines: principle of operation, construction, AC windings, generation of rotary magnetic field, equivalent circuit, expressions of torque and mechanical power, load angle, circle diagram of simplified machine, reactive power compensation by synchronous machines.

14. Asynchronous machines: principle of operation, AC windings, generation of rotary magnetic field, construction, rotor types, concept of slip, equivalent circuit, torque-angular velocity curve, methods for revolution control, single phase asynchronous motors.

**POWER ELECTRONICS:**

15. AC Voltage Controllers. Cycloconverter. Illumination control circuit and its operation. Phase-control type. Phase half-wave control type. On-off control type. Three-phase ACVCs.

16. DC-DC converters. Step-down chopper (buck-converter) connected to resistive load and RLE load. Step-up chopper (boost-converter). Four quadrant, full bridge DC-choppers, circuit diagram and operation.

17. DC-AC converters, inverters. Half-bridge inverter. Bridge inverter. Three phase inverters and their conduction strategies.

**ELECTRICAL SWITCHGEARS:**

18. Low-voltage circuit breakers: parameters, requirements, classification, their structure and operational principles.

19. Contactors: parameters, classification, function, structure, operational, arc quenching units, contacts, utilization categories, life span curves, selection.

20. Motor-protective devices, their selection.