

Czech Technical University in Prague

Faculty of Electrical Engineering

Department of Electric Drives and Traction

Exam questions to the subject: **AE1M14PO2 – ELEKTRIC DRIVES AND TRACTION 2**

I. Energy Consumption and Environment, Hybrid and Electric Cars, Rail Transport

1. What is the largest energy consumer on the world (Mobility, Industry, Agriculture, Households, Automobile transport versus railways transport, Air transport, Ships, ...) ?
2. Can the human activity change the climate on the world ? What climate changes are today observed ? What sources can implicate these changes ?
3. What pollution of the atmosphere implicates the petrol burning ?
4. How hybrid cars and electric cars can improve this situation ?
5. Describe the electric supply systems used for trolley in railway transport in Europe.
6. Describe the tram cars 15T working in Prague.
7. Describe the function of Czech Double-system loco with pulse controlled traction motors.
8. Describe the function of Czech DC loco with pulse controlled traction motors.
9. Describe the function of Czech loco 109E ČD380.

II. Dimensioning of Electric Drives, Using Frequency Converters for Pumps and Fans

10. Philosophy, baseline data, and basic steps of electric drive dimensioning.
11. Motion equation, acceleration quality assessment, allowable acceleration time.
12. Insulation classes, motor winding temperature rise checking, overload capacity.
13. Dimensioning specifics of the controlled drive with frequency converter.
14. Voltage resonance, permitted voltage stress on motor windings, and critical speed limits at drive frequency control.
15. Drive dimensioning in the area of constant magnetic flux and in the area above the field weakening point.
16. Methods for controlling fans and pumps and their comparison.
17. Benefits and limiting factors of variable speed drive using frequency converters for controlling fans and pumps.
18. Concrete dimensioning process of the controlled drive with a load torque of constant progression (for example plunger pump) and with a load torque of quadratic progression (for example centrifugal pump).

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