ELEC-E8422 An Introduction to Electric Energy

Exercise Session 7: Electric Safety

EX1

A big man gets in contact with a conductor having voltage 230 V. What is the current flowing through his body. Body resistance is 1000 Ω and soil resistivity is a) ρ=100 Ωm, b) ρ=2300 Ωm. c) How long it takes until he gets heart fibrillation.

EX2

A man climbs 10 m high wood pole having total resistance 1 MΩ. On the top of the pole, the insulator is broken and the cross arm is in 20 kV voltage (line voltage, i.e. phase-phase). Man is carrying a grounding wire, the other part of which is in contact to soil (assume 10 kΩ contact resistance). Assume that the body resistance is 1000 Ω and that the man can stand 20 mA current until he can't control his muscles any more. How high can he climb? (in this kind of situation, if he does not fall down, he will die in about 20 seconds because of respiratory tetanus ….).

EX3

A man is running on soil of 2300 Ωm resistivity. In close by network happens a single phase to ground fault of 100 A. How large a current flows through the man, if body resistance is 1000 Ω and we assume one foot being 5 m from the fault point and the other 6 m. Use Thevenin's method.

EX4

At a distribution transformer takes place a single phase to ground fault, which causes 50 A current to flow to a 20 Ω grounding resistance. How quickly must the fault current be interrupted in a) base case, b) if potential grading is in use?