

## ELEC-E8413 POWER SYSTEMS

EXAM 4.12.2023

ANSWER ONLY TO FIVE OF THE FOLLOWING QUESTIONS:

1. In a 20 kV three phase system the phase current is 15 A and is lagging the phase voltage by 25 degrees. Calculate a) real power, b) reactive power, c) apparent power transmitted.
2. The maximum heating of a conductor is 80 degrees, mass 145 kg/km, specific heat capacity 910 Ws/°C kg and resistance 0,673 ohm/km. Compute the maximum 1 second short circuit current.
3. A power system has kinetic energy of 300 000 MWs. Suppose that a production of 1300 MW is disconnected. What is the rate of frequency change?. What is the final state frequency if the stiffness of the system is 1000 MW/Hz and there is no power control.
4. Explain the referring of voltage, current and impedance from the transformer secondary to the transformer primary.
5. Explain load duration curve, load duration time, load factor, diversity factor, coincidence factor.
6. Calculate the positive sequence reactance / km of a three phase power line having conductors in the same horizontal plane. The conductor diameter is 7 mm and the distance between outer conductors and the middle conductor is 1.1 meters.
7. Different factors affecting the load current capacity of underground power cables.

Answers accepted in English, Finnish and Swedish.

Questions are available only in English.