AC Power

Basic Problems

1. The rms voltage for American sockets is 110 V. Calculate the voltage amplitude.
2. The label on an ac motor reads "230 V/0.3 A/50 W". What do these numbers stand for? Calculate the motor's power factor and phase shift.
3. A capacitor with capacitance 22 μF and a resistor with resistance 150 Ω are connected in series to a 230 V socket. Calculate the effective power measured by a power meter.
4. How can the power factor of an ac motor be increased?
5. Construct the phase shift between current and voltage for an ac motor with ratings 230 V / 3 A / 500 W.
6. A high voltage transformer with 500 turns in its primary and 23'000 turns in its secondary coil is connected to 230 V. Calculate the voltage across the secondary coil.
7. A transformer has a primary coil with 1'200 turns. A copper ring is used as the secondary coil. When the transformer is connected to 230 V, the stationary current flowing through the ring is 34 A. Calculate the minimum power rating of the transformer.
8. The voltage of high voltage power lines shall be increased from 230 kV to 380 kV. By how many percents are the transmission losses reduced?

Additional Problems

9. A coil with iron core is connected to a 230 V socket. The rms current is 1.0 A and the effective power 50 W. Calculate the phase shift between current and voltage and the inductance and resistance of the coil.
10. A transformer for 12 V/50 W halogen lamps steps down the household voltage. Its primary coil has 960 turns.
    a) Calculate the number of turns of the secondary coil.
    b) Calculate the current flowing through the primary coil.
    c) Is it better to place the switch in the primary or secondary circuit? Give reasons considering the safety and energy efficiency.

Solutions to Basic Problems: 1. 156 V; 2. 0.74, 44°; 3. 180 W; 5. 43°; 6. 10.6 kV; 7. 6.5 W; 8. -63 %