Voorblad
Bij dit tentamen mag gebruik gemaakt worden van een handgeschreven formuleblad met 10 formules. Geen schema's.
Maak elke "problem" opgave op een aparte bladzijde. Geef niet alleen de eindantwoorden maar ook de tussenantwoorden. Onderstreep de antwoorden. Succes!

Problem 1 (10 points)

A motor is connected to a power supply of 230V 50Hz and draws 5A current.
The power factor is 75% lagging.
Calculate:
a) The reactive power absorbed by the motor. *(2 points)*
b) The active power absorbed by the motor. *(2 points)*
c) The power factor must be corrected to 0,9 by connecting a capacitor parallel to the motor. Calculate the value of the capacitor. *(3 points)*
d) Draw the fasordiagram of the voltage, the current trough the capacitor, the current trough the motor, and the current supplied by the power supply. *(3 points)*
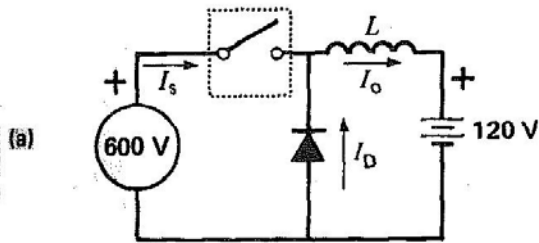
Problem 2 (10 points)

A 3 phase synchronous generator produces an open-circuit line-to-line voltage of 6928 V when the DC exiting current is 50 A. The AC terminals are then short-circuited, and the three line currents are found to be 800 A.
a) Draw the per phase equivalent circuit in the open-circuit situation including the line-to neutral voltage. *(2 points)*
b) Calculate the synchronous reactance per phase. *(3 points).*
c) Calculate the terminal voltage (line to neutral) if three 12Ω resistors are connected in wye across the terminals. *(3 points)*
d) Draw the fasor diagram with the voltages and the current of situation c). *(2 points)*

Problem 3 (10 points)

We wish to charge a 120V battery from a 600V dc source using a dc chopper. See fig (a)
The average battery current should be 20A, with a peak-to-peak ripple of 2 A. If the
chopper frequency is 200 Hz, calculate the following:
a) The current drawn from the source.(2 points)
b) The current in the diode. (2 points)
c) The duty cycle. (3 points)
d) The inductance of the inductor. (3 points)

Questions (10 points)

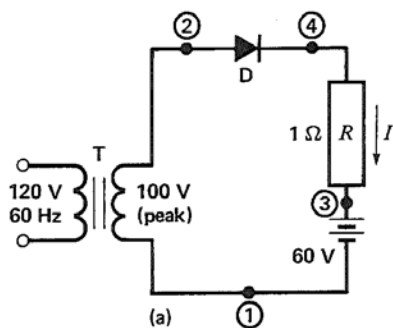| 1. *(1 point)*
 Draw the symbol and state the typical properties of a thyristor and MOSFET |
|---|
| 2. *(2 point)*
 Draw the complete torque speed curve of a 3 phase induction machine and mark the brake + motor and generator region. |
| 3. *(2 points)*
 Draw the schematic of a two quadrant and a four quadrant electronic DC-DC converter with the use of IGBT switches and diodes. |
| 4. *(3 points)* Simple battery charger.
 Draw the voltage between point 2 and 1, 3 and 1 and 4 and 1 and current I of the circuit from fig. 21.11

 Figure 21.11
 a. Simple battery charger circuit. |
| 5. *(1 point)*
 What is the definition of "power factor" PF? |
| 6. *(1 point)*
 Explain the meaning of the following terms.
 1) Anode 2) Cathode 3)Inverter |