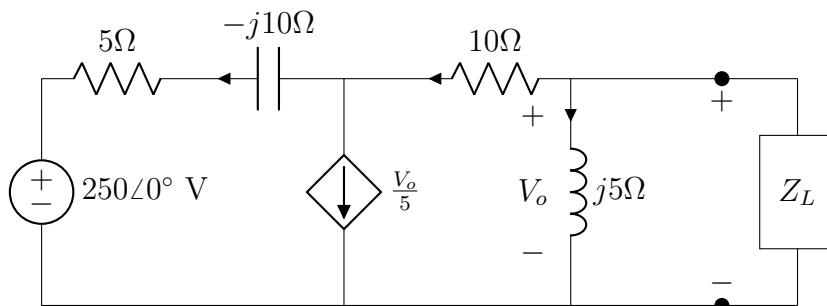


Midterm-I Exam

1. (40 pts) The load impedance Z_L in the circuit shown below is adjusted to ensure that the maximum average power is delivered to Z_L .
- Determine the maximum average power delivered to Z_L .
 - Calculate the percentage of the total power developed in the circuit that is delivered to Z_L .



2. (30 pts) A motor supplied by a 220 V (rms) source draws a current of 7.6 A (rms) and consumes an average power of 1500 W. The current lags the voltage (lagging power factor). The supply has an angular frequency of $\omega = 377$ rad/s.
- Calculate the apparent power, reactive power, and power factor of the motor.
 - Find the type and value of the component to be connected in parallel with the motor in order to obtain an overall power factor of 0.8.
3. (30 pts) A parallel RLC circuit is supplied by a sinusoidal current source. The circuit parameters are given as:

$$R = 1 \text{ k}\Omega, \quad L = 50 \text{ mH}, \quad C = 20 \text{ }\mu\text{F}$$

The angular frequency of the current source is $\omega = 900$ rad/s.

- Determine the resonant angular frequency ω_0 of the circuit.
- In order to make the circuit operate at resonance at $\omega = 900$ rad/s, an additional element is to be connected in parallel with the existing components.

Determine:

- the type of the element (inductor or capacitor),
- and its required value.