

### Quiz 3

Name of student:

Class number: ZM20\_\_

Registration number:

Time: 90 minutes

Each Question carries 20 marks. Total: 100 marks

#### Question 1:

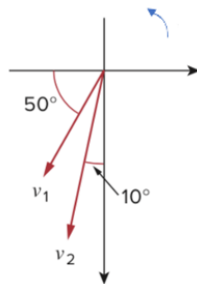
- a) For the two complex numbers given, the value of  $(X-Y)^*$  in polar form is: \_\_\_\_\_

$$X = 8 \angle 40^\circ \quad Y = 10 \angle -30^\circ$$

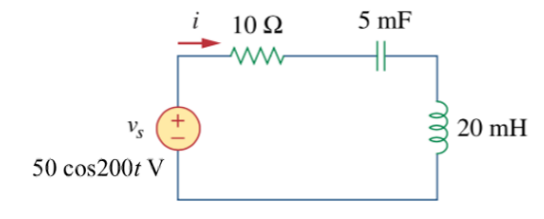
- b) An ideal transformer is rated at 2400/120 Volts, 9.6 kVA. It has 50 turns on the secondary side. The number of primary turns is \_\_\_\_\_.

- c) At a frequency of 31.83 Hz, the capacitive reactance of a  $10\text{-}\mu\text{F}$  capacitor is \_\_\_\_\_ ohms.

- d) (Choose the right answer) The figure below shows that voltage  $v_1$  \_\_\_\_\_ (lags  $v_2$  by  $50^\circ$ / leads  $v_2$  by  $30^\circ$ / lags  $v_2$  by  $30^\circ$ ).



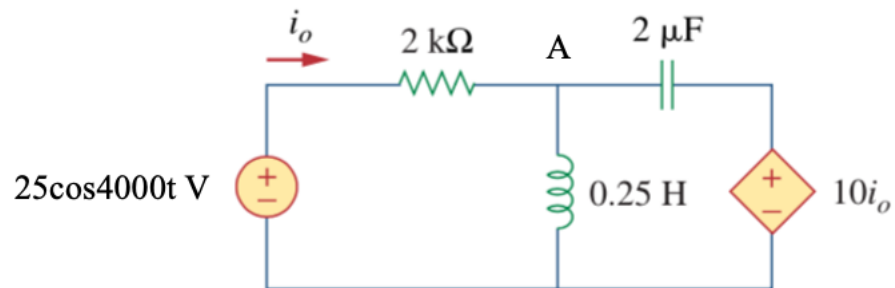
- e) In the circuit below, the phasor current is:  $I =$  \_\_\_\_\_ Amps.



**Question 2:** AC Node Voltage method

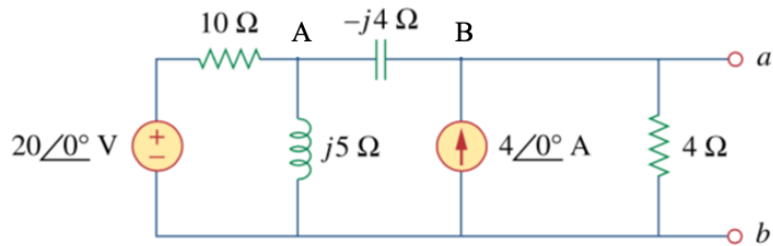
In the circuit shown below:

- Draw the frequency-domain equivalent circuit
- Write a KCL at node A. Also, write a constraint equation for  $I_o$
- Then, find the value of the current  $i_o(t)$



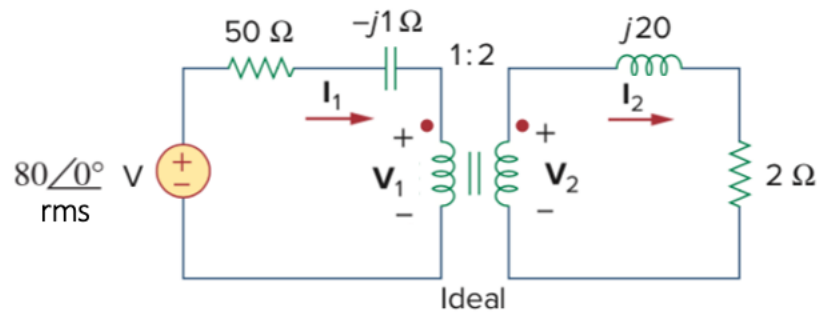
**Question 3: AC Thevenin's Theorem**

For the circuit shown, draw the Thevenin equivalent circuit as seen at terminals  $a$ - $b$  by finding  $V_{Th}$  &  $R_{Th}$ . To find  $V_{Th}$  you must write node-voltage equations at A & B.



#### Question 4: Ideal Transformer

- Calculate the primary phasor current  $I_1$  in the ideal transformer shown below. (First step, reflect the impedance of the secondary into the primary).
- Also calculate the secondary current  $I_2$  using the formula connecting primary & secondary current to the turns-ratio 'n'. Use positive sign in the formula.
- What is the power absorbed by the  $2\ \Omega$  resistor?



### Question 5: (Complex Power)

In the circuit below,

- Find the two branch currents and the total current
- Find the total complex power, total apparent power, total real power, and total reactive power
- Calculate the power factor (pf) as seen from the source, and explain why this pf is either lagging or leading

