

Name:

ID :

## PRINCIPLES OF EE1

### Homework #4 - Group 03

Submission deadline: November 30, 2020.

**IMPORTANT:** You should hand in a copy of your report that contains a full and detailed description of all the work done on the homework. Marks will be deducted if there are sign of violation of regulation and late submission (20% for each day). You should print out this document and write down your solution directly on it.

*Tip: You should draw a bounding box for your final answer. Ex:  $I = 2 + 4 = \boxed{6 \text{ A}}$*

**Problem 1: (15 marks)** Find the phasor transform of each trigonometric function:

a/  $v = 220\cos(5t - 59^\circ) \text{ V}$

b/  $v = 170\cos(377t + 40^\circ) \text{ V}$

c/  $i = 110 \sin(110t + 30^\circ) \text{ A}$

d/  $i = [5\cos(\omega t + 36.87^\circ) + 10\cos(\omega t - 53.13^\circ)] \text{ A}$

e/  $i = 10 \sin(1000t + 20^\circ) \text{ A}$

**Solution:**

**Problem 2: (15 marks)** Find the time-domain expression corresponding to each phasor:

a/  $V = 18.6\angle -54^\circ \text{ V}$

b/  $V = (20 + j80 - 30\angle 15^\circ) \text{ V}$

c/  $I = (20\angle 45^\circ - 50\angle -30^\circ) \text{ mA}$

**Solution:**

**Problem 3: (30 marks)**

The voltage at the terminals of capacitor  $0.8\text{ F}$  shown in figure below. The voltage is described by the following equations:

$$v_c(t) = \begin{cases} 0, & t < 0 \\ 40e^{-15000t}\sin(30000t), & t \geq 0 \end{cases}$$

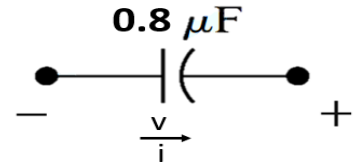


Fig. 1

a/ Find  $i(0)$

b/ Calculate the power delivered to the capacitor at  $t = \pi/80\text{ ms}$

c/ Calculate the energy stored in the capacitor at  $t = \pi/80\text{ ms}$

**Solution:**



**Problem 4: (20 marks)**

The maximum amplitude of a sinusoidal current is  $40\text{ A}$ . The current passes through one complete cycle in  $0.5\text{ ms}$ . The magnitude of the initial current is  $10\text{ A}$ . Finding the characteristics of a Sinusoidal Current via questions as below:

- a) What is the frequency (in Hz) of the current?
- b) What is the frequency in rad/s?
- c) Write the expression for  $i(t)$  using the cosine function. Express  $\phi$  in degrees.
- d) What is the rms value of the current?

**Solution:**

**Problem 5: (20 marks)**

The self-inductances of the coils in Fig. 2 are  $L_1 = 16mH$  and  $L_2 = 25mH$ . The coefficient of coupling is 1.

a/ Calculate the energy stored in the system when  $i_1 = 6A$  ,  $i_2 = 9A$

b/ If  $i_1 = 6A$ , find value of  $i_2$  in zero stored energy?

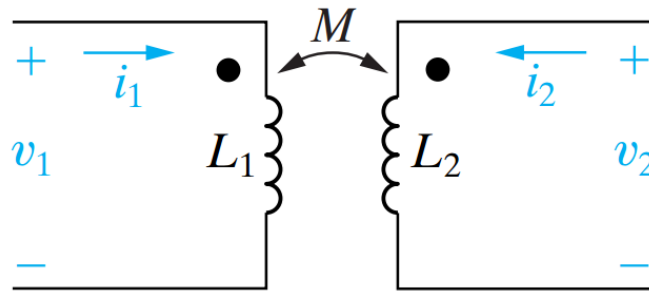


Fig. 2

**Solution:**