राष्ट्रीय प्रौधोगिकी संस्थान गोवा
NATIONAL INSTITUTE OF TECHNOLOGY GOA
Farmagudi, Ponda, Goa – 403 401, India
Department of Electrical and Electronics Engineering
Website: http://www.nitgoa.ac.in
Phone : 0832-2404218
Fax : 0832-2404202

EE152 Basic Electrical Science Lab

Session – 5

Power Calculations in AC Circuits

1. A. Introduction:

This session makes students to understand the analysis of AC circuits through a Simulation platform, MATLAB/Simulink.

1. B. Objectives:

a. Acquire a good knowledge on the AC electrical circuits.

b. Verification of the theoretical knowledge on steady state characteristics of AC electrical circuits in MATLAB/Simulink Platform.

1. C. Theory: Refer to the notes or necessary materials mentioned in EE151 course.

1. D. Statement of Experiments:

Fig. 5.1 represents an AC network, where an AC sinusoidal voltage source ($V(t) = 230\sqrt{2}\sin(100\pi t)$) feds power to a load ($R = 10\ \Omega$, $L = 1$ mH, $C = 1$ mF). The following task has to be done theoretically and those have to be verified by simulation in MATLAB. 1. Find load impedance. 2. Derive the expression of various responses. 3. Draw the phasor diagram of these responses. 4. Calculate various power components. 5. Calculate Power Factor. 6. Find the value of source frequency at which the power factor will be unity.

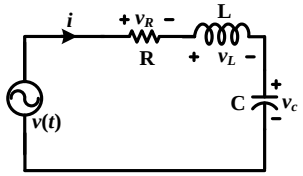

Fig. 5.1

1. E. Procedure:

Determine all the parameters asked in section-1.D theoretically and draw corresponding experimental circuit (necessary measuring instruments are to be incorporated in the circuit) of the circuit shown in Fig. 5.1. Construct the experimental circuits in Simulink domain, simulate it fill up the Table - 5.1. A brief procedure is mentioned below

- Draw only load in simulink and with the help of "***Impedance Measurement***" block, find impedance of the circuit.
- Draw the full experimental circuit in Simulink and plot all the responses in workspace. With the help of scope waveform and the plots in workspace, verify various expression derived theoretically.
- With the help of "***Power***" block, find various power components

1. F. Assignments:

Consider same parameters (as mentioned in Section – 1.D) for Fig. 5.2 and do the same as mentioned in Section – 1.D

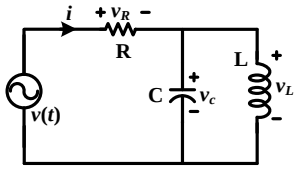

Fig. 5.2

Table - 5.1

Sl. No	Load Impedance, Ω		Active Power, kW		Reactive Power, kVAR		Apparent Power, kVA		Power Factor		Frequency (Hz) at UPF	
	Theoretical	Simulation	Theoretical	Simulation	Theoretical	Simulation	Theoretical	Simulation	Theoretical	Simulation	Theoretical	Simulation
1												
2												
3												