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EE152   Basic Electrical Science Lab
Session – 6
Study of Diode Rectifier Circuits

1. A. Introduction:

This session makes students to understand Diode Rectifiers (Half wave, Full wave) and to verify its characteristics through a Simulation platform, MATLAB/Simulink.

1. B. Objectives:

a. Acquire a good knowledge on Diode Rectifier circuits.

b. Verification of the theoretical knowledge on Diode Rectifier 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. 6.1 represents a half wave rectifier diode circuit, where an ac sinusoidal voltage source (v(t) = $230\sqrt{2}\sin(100\pi t)$) gets converted to DC waveform and feds power to a dc resistive load (R = 10 Ω). The transformer, T_1, is having turns ratio of 230/6 ($n_1 : n_2 = 230 : 6$). The following task has to be done theoretically and those have to be verified by simulation in matlab.

1. Derive the expression of vL(t) and iL(t). 2. Draw vL(t) and iL(t). 3. Find the value of average DC voltage VL across and current IL through load. 4. Find PIV of the diode, D1. 5. Find the rms value of output voltage and current. 6. Find rectification efficiency. 7. Check the output voltage waveform with a capacitor (with two values: 1µF and 1 mF) in parallel with load resistance.
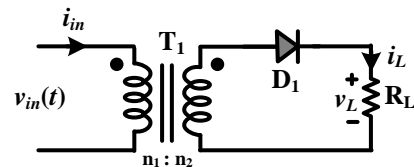

Fig. 6.1

1. E. Procedure:

Determine all the parameters asked in section- 5.3 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 - 6.1. A brief procedure is mentioned below.

- Considering ideal diode (put on state voltage as zero), draw the circuit in *Simulink* and run it for 0.1 sec.
- Using "Mean" block, measure average values and using "RMS" block, measure rms values.

1. F. Assignments:

Consider Fig. 6.2 with v(t) = $230\sqrt{2}\sin(100\pi t)$, R = 10 Ω and do the same as mentioned in Section - 1.D. Prepare an appropriate table and fill up it.
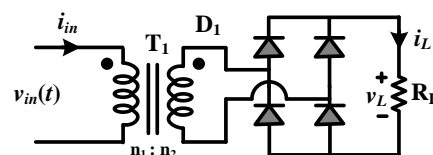

Fig. 6.2

Table - 6.1

Sl. No	Average DC Voltage (volt)		Average DC Current (Amp)		PIV of Diode (volt)		Output RMS Voltage (volt)		Output RMS Current (Amp)		Rectification efficiency (%)	
	Theoretical	Simulation	Theoretical	Simulation	Theoretical	Simulation	Theoretical	Simulation	Theoretical	Simulation	Theoretical	Simulation
1												
2												
3												