Curriculum Topic :
Time-Domain Transmission Lines

TDT7 : Short Pulses on Transmission Lines

Module Outline:	
Prerequisite Skills	Competencies
Supplemental Reading and Resources	Assessments
Laboratory Activities	Power Point Slides and Notes

Prerequisite Skills

Prerequisites / Requirements:
TDT6 Initially charged transmission lines

Competencies

Competency TDT.7: **Trace the evolution of a pulse on a transmission line in space and time.**

Competency Builders:
TDT.7.1 Calculate the amplitude of a pulse at any point in space or time on a transmission line.
TDT.7.2 Sketch in space or time a pulsed voltage of arbitrary shape on a transmission line.

Supplemental Reading and Resources

Supplemental Reading Materials:

A.F. Peterson and G.D. Durgin. *Transient Signals on Transmission Lines: An Introduction to the Non-Ideal Effects and Signal Integrity Issues in Electrical Systems*. Morgan & Claypool Publishers, 2009. Chapter 7.

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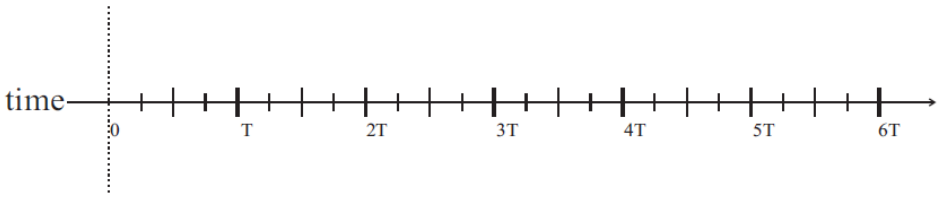
Assessments

The following questions and exercises may serve as either pre-assessment or post-assessment tests to evaluate student knowledge.

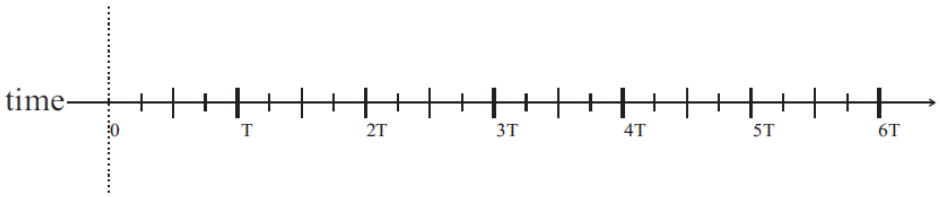
Question: TDT7.1 *Competency:* TDT.7.1

Reflection Sketches: There is an uncharged transmission line with transit time T, length D, and reflection coefficients $\Gamma_G = \frac{1}{2}$ and $\Gamma_L = -\frac{1}{2}$. At $t = 0$ an **ideal impulse**, $f(t) = 16\delta(t)$, enters the source-side of the line. Sketch the following functions of time in the space provided below. Please label the amplitudes of your pulses and show the appropriate modulus (sign) and relative increasing/decreasing behavior of amplitudes. (**21 points**)

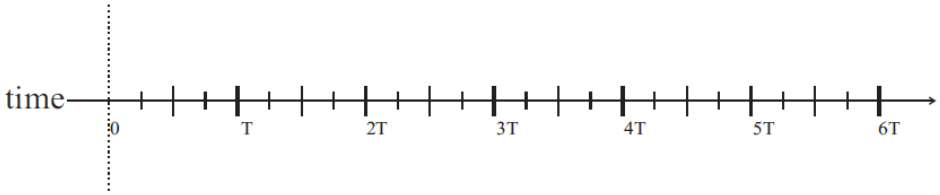
a. The voltage observed at the load side of the transmission line:



b. The voltage observed at the source side of the transmission line:



c. The voltage observed exactly **one-quarter** ($z = \frac{D}{4}$) down the transmission line:



Answer:

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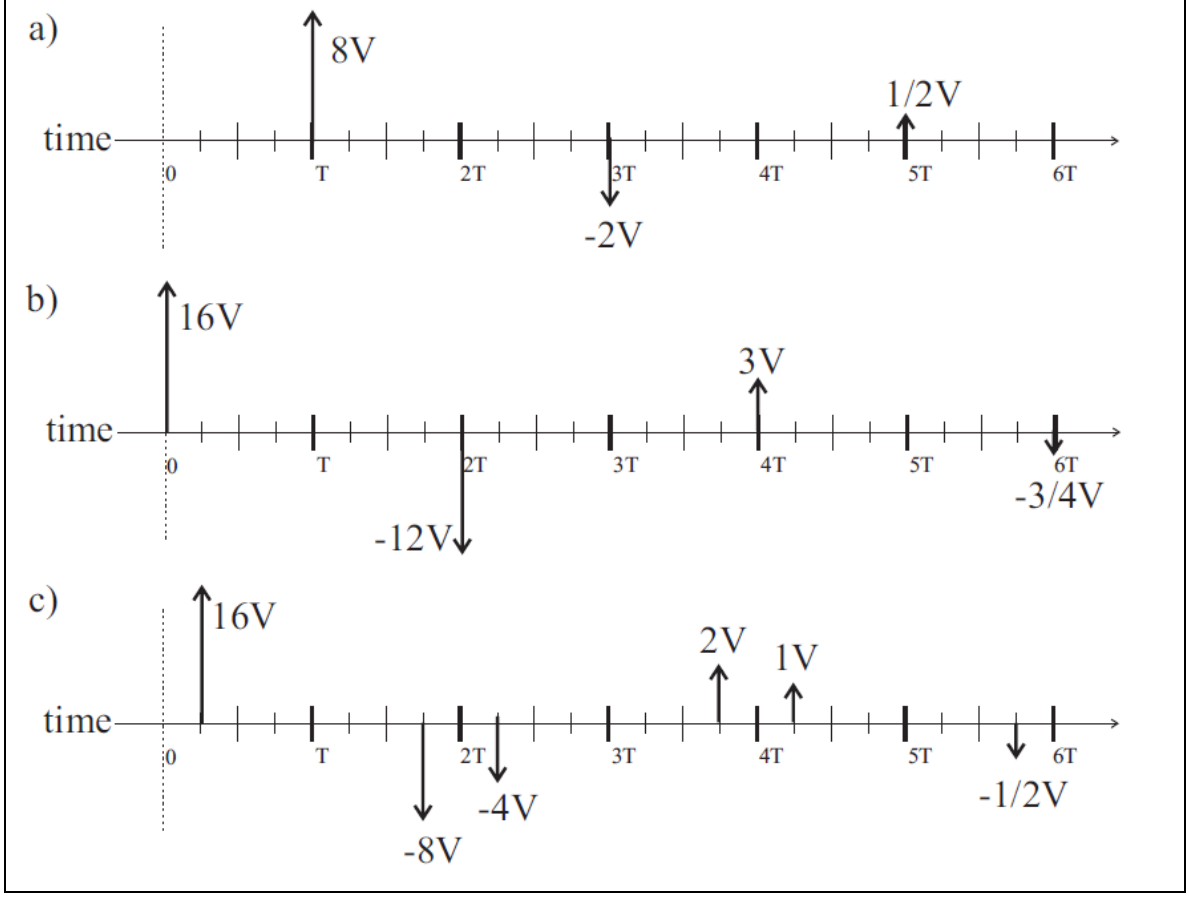
Reflection Sketches:



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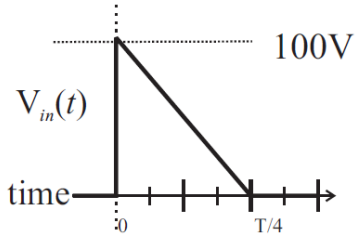
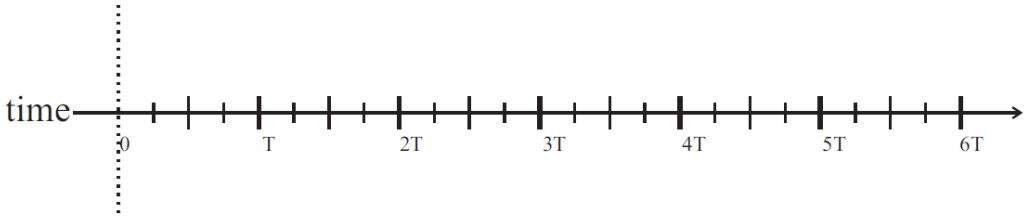
Question: TDT7.2 *Competency:* TDT.7.2

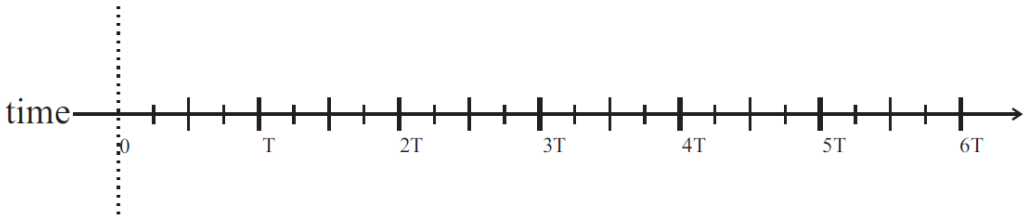
Reflection Sketches: There is an uncharged transmission line with transit time T, length D, and reflection coefficients $\Gamma_G = -\frac{4}{5}$ and $\Gamma_L = \frac{1}{2}$. At $t = 0$ a short triangular voltage waveform (see sketch) is excited on the source side of the line and begins to travel toward the load. Please sketch and label the amplitudes of the time-domain waveforms that would be measured at the locations listed below. (**30 points**)



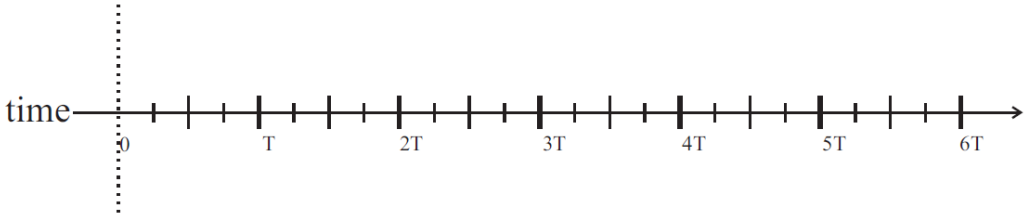
a. The voltage observed at the load side of the transmission line:



b. The voltage observed at the source side of the transmission line:



c. The voltage observed exactly **halfway** ($z = \frac{D}{2}$) down the transmission line:



Answer:

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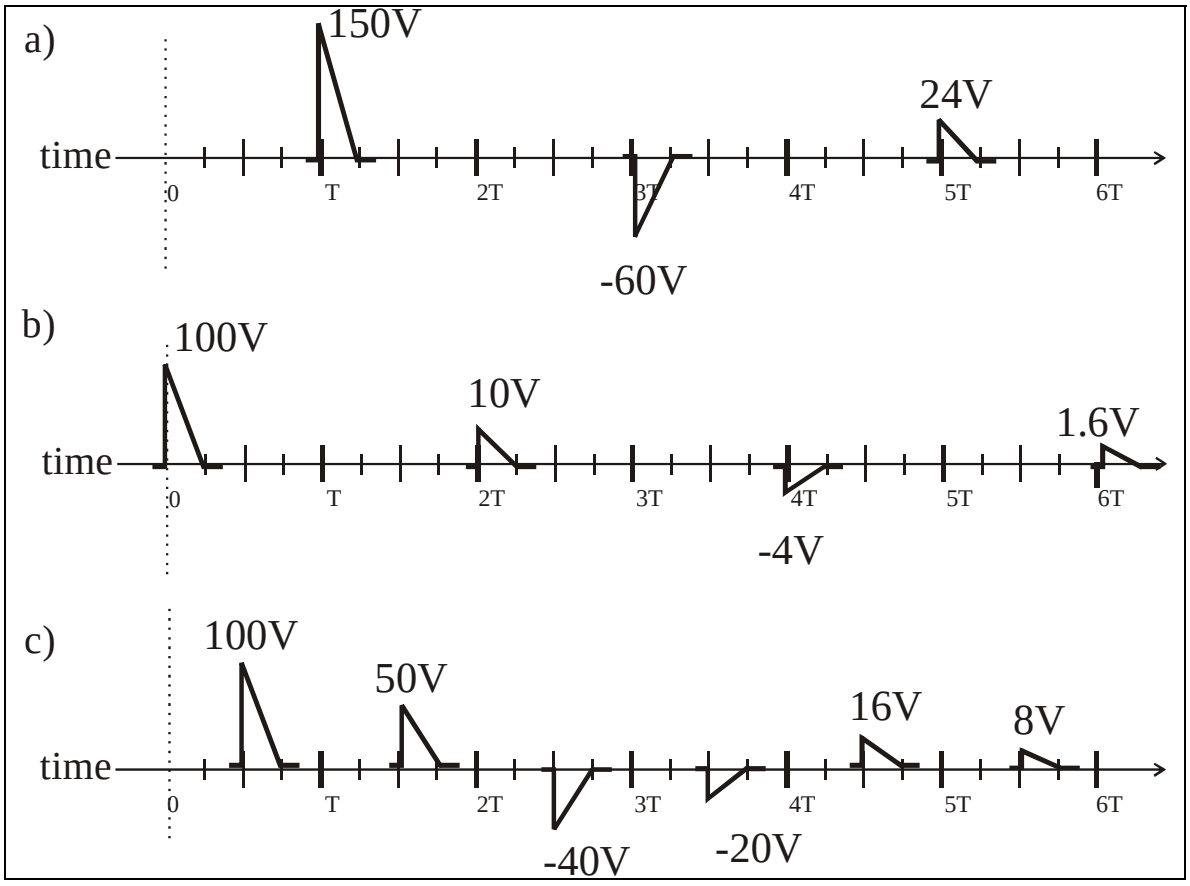

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