PROBLEMS

16.1 Find the transit time of a pulse through 15 m of RG-59/U coaxial cable.

16.2 Describe a convenient method of measuring the characteristic impedance of a coaxial cable by varying its termination conditions.

16.3 For each instance cited below, determine whether termination to prevent cable reflections is potentially needed.

(a) Transmission of 0.5 μs rise time pulses through 20 m of RG-59/U cable.

(b) Transmission of a 10 ns rise time pulse through 10 m of RG-62/U cable.

16.4 **(a)** Fast pulses are to be transmitted from a source with output impedance of 50 Ω to another component with input impedance of 1 kΩ. Choose one of the coaxial cable types listed in Table 16.1, and show the termination conditions required to avoid cable reflections at either end.

(b) If the output pulse amplitude from the source without any load attached is 5 V, find the amplitude that appears across the input of the second component after the termination required in part (a).

16.5 Find the resistance values R_1 and R_2 in the T-attenuator network of Fig. 16.5 if an attenuation factor of 10 is needed while preserving a 50-Ω impedance level.

16.6 Prove that the resistance values in the pulse splitter of Fig. 16.6 should be 16.6 Ω in order to distribute a pulse to two 50-Ω loads while maintaining a 50-Ω impedance level.

16.7 Pulses from a preamplifier are produced with exponential tails with 50-μs time constant. What is the minimum spacing between adjacent pulses so that amplitude change due to pile-up is less than 1%?

16.8 An input voltage of the form $V(t) = E[1 - \exp(-t/$ where E and k are constants, is supplied to a simple RC integrator circuit. Derive the form of the output voltage.

16.9 A differentiator circuit has component values of C = 500 pF and R = 500 Ω. Find the frequency of a sinusoidal input voltage that will be attenuated by a factor of 2 by the circuit.

16.10 A step voltage of 1 V amplitude is applied to the input of a *CR-RC* differentiator–integrator network with equal time constants. What is the amplitude of the shaped pulse?

16.11 Derive Eq. (16.22) for the response of a *CR-RC* network to a step voltage input by using Eq. (16.12) as the input waveform to the *RC* stage.

16.12 What is the principal advantage of bipolar shaped pulses over monopolar shaped pulses?

16.13 What property of the detector is reflected in the rise time of the tail pulse obtained by a large time-constant collection circuit?

16.14 Pulses from a detector are shaped to produce monopolar pulses of approximately triangular shape with 10 V amplitude and width of 5 μs. Find the *average* value of the baseline shift after these pulses are passed through a capacitor if the pulse rate is 100/s. Repeat for a rate of 50,000/s.

16.15 Sketch the result of shaping a rectangular monopolar pulse of 200 ns width by using a shorted stub of RG-59/U of 10-m length.