**Exercises on High Voltage Engineering (May 22, 2025):**

**Exercise 8-1:** There are 4 outlet lines connected to the bus bar of a substation, and the surge impedance of each outlet line is 400Ω. A travelling voltage wave with a amplitude of 1000kV invades the substation along one of the outlet lines. Please calculate the overvoltage amplitude on the bus bar.

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**Exercise 8-2:** There are *A*, *B*, *C* 3 outlet lines connected to the bus bar of substation, whose surge impedance is 300Ω, 400Ω and 420Ω respectively. If an infinite step voltage wave with the amplitude of 1000kV is travelling from outlet line *C*, please find the refraction wave on outlet line *A* and the reflection wave on outlet line *C*.

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**Exercise 8-3:** A 2500kV step voltage wave enters along a line with the surge impedance of 300Ω, and the end of the line is connected to the ground through a capacitor of *C*=0.01μF. Please find the voltage waveform on the capacitor.

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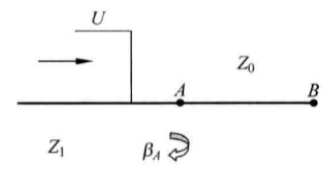
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**Exercise 8-4:** A 10kV generator with the surge impedance of 400Ω of its winding is directly connected to the overhead line, and now a 80kV step voltage wave enters the generator along the line with the surge impedance of 280Ω. In order to ensure that the steepness of impulse voltage at the generator entrance does not exceed 5kV/μs, please calculate the capacitance of the capacitor that needs to be paralleled to the generator.

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**Exercise 8-6:** The head of a lossless line segment with the surge impedance of *Z*0 is connected to another lossless line with the surge impedance of *Z*1 at point *A*, whose end point *B* is open, as shown in the following figure. Given that the time for travelling wave to pass through *AB* is *τ*, and the reflection coefficient of the wave entering from left to right at point *A* is *βA*= - 0.7. If a step voltage wave of *U*=500kV enters from left to right, reaching point *A* at *t*=0, please give the voltage waveforms *u*A(t) and *u*B(t) at two points *A* and *B* within *t*≤3*τ*.



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**Supplementary Exercise:** DC power supply *E* switches on an open-end line with length of *l* at *t*=0, as shown in Figure 8-7(a) of the textbook. *τ* is the time of travelling wave go through the length of *l* in the line. What is the voltage and current waveform on the point *C* which is in the middle of the line?

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