ECE 3025: Electromagnetics

Solutions to TEST 1 (Fall 2006)

(1) Short Answer Section

(a) true

(b) $\lambda/2$

(c) VSWR

(d) microstrip

(e) $\lambda/4$

(f) false

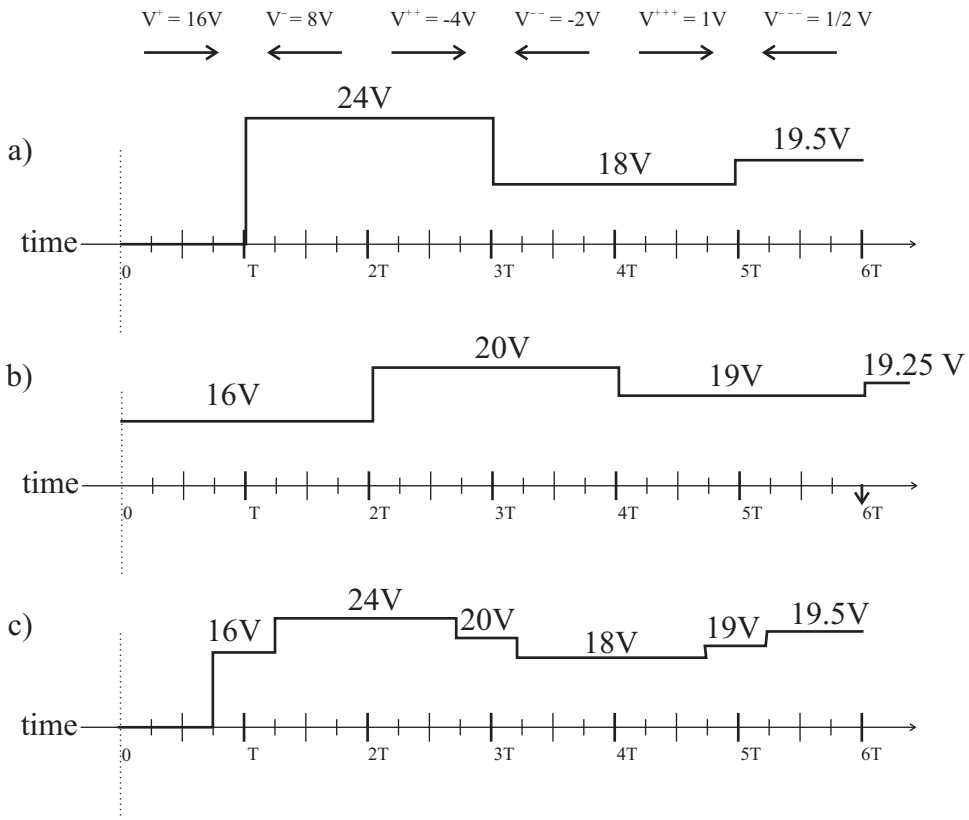
(2) Descriptive Answer Section

(a) **Power Lines:** There are several problems with burying high-voltage lines. Ground is a lossy dielectric and will result in possible shunt conductance loss. Some students even mentioned that there could be reverse breakdown potential through soil (true). Also, the permittivity of the ground is higher than air and will retard the velocity of propagation. This effectively lengthens the line and pronounces the load transformation effect.

(b) **Active Component Loading:** We can see from the reflection coefficient formula that a *negative* resistance at the load of a transmission line will result in a load reflection coefficient Γ_L with magnitude *greater* than 1. The load will send more power down the line than it receives. For some configurations and bad source-side mismatches, this could even lead to enough positive feedback to make a reflection that continually grows and grows until the circuit burns up or the op-amp hits its power rails.

(c) **Crosstalk:** I accepted any of the following: a) put components closer together (shorter t-lines), b) put traces farther apart, c) run traces perpendicular to one another where possible, d) use ground planes/multi-layer boards, e) match all terminations (at least the crosstalk won't echo), f) drill vias around traces (like the example PCB we passed around in class).

(3) **Reflection Sketches:**



(4) **Switching Network:**

	V_1	V_X	V_Y	V_1^+	V_1^-
State 0	0	0	0	0	0
State 1	12	0	0	12	0
State 2	24	0	0	12	12
State 4	16	8	8	12	4
State 5	8/3	8	8	-4/3	4