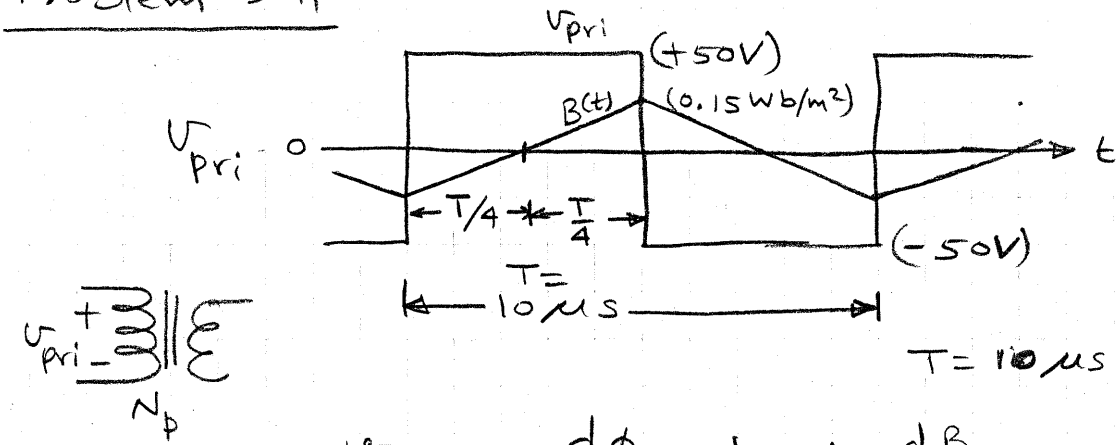
Problem 3-11



T = 10 μs

$$v_{pri} = N_{pri} \cdot \frac{d\phi}{dt} = N_{pri} A_c \frac{dB}{dt}$$

In the plot above, the flux density reaches its peak from zero in T/4 seconds. Therefore, from the above equations,

$$B_{peak} = \frac{1}{N_{pri} A_c} \int_0^{T/4} v_{pri} \cdot dt$$

$$0.15 = \frac{1}{N_{pri}\ 0.635 \times 10^{-4}}\ 50 \times \left(\frac{10}{4} \times 10^{-6}\right)$$

$$\therefore \quad N_{pri} = 13.12$$

Therefore, N_{pri} = 14 turns minimum to keep flux density below the saturation level.