1. An oscillator is shown below

![Oscillator Circuit Diagram]

a) Design this oscillator to deliver 1 mW of power at 1 MHz to $R_L$. Assume an ideal transformer and a lossless inductor. Design with an initial loop gain of 3 and a loaded Q of 20.

Specify all components. For the transistor $\beta = 20, f_T = 250$ MHz .

b) For the design above, calculate the change in output power if the supply voltage falls to 7V.

c) For the design in (a), calculate the new frequency of oscillation and output power if there is additional phase shift of $-15^\circ$ in the loop.

d) Calculate the percent (%) of second and third harmonic distortion in the output voltage in (a).

e) Use SPICE to check your answers to (a). This will require a "TRAN" run. Examine collector voltage and current waveforms.