K. J. SOMAIYA COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRONICS ENGINEERING
ELECTRONIC CIRCUITS
Power Amplifier Circuits

Numerical 1:

In a class B power amplifier, load $R_L = 10\Omega$, supply volatge $V_{CC} = 18V$, $V_{EE} = -18V$, AC input voltage is $16V$ peak, frequency is $1000Hz$. Calculate the efficiency of the circuit. Select suitable power transistor having ratings: I_C close to $5A$ & V_{CEO} close to $30V$.

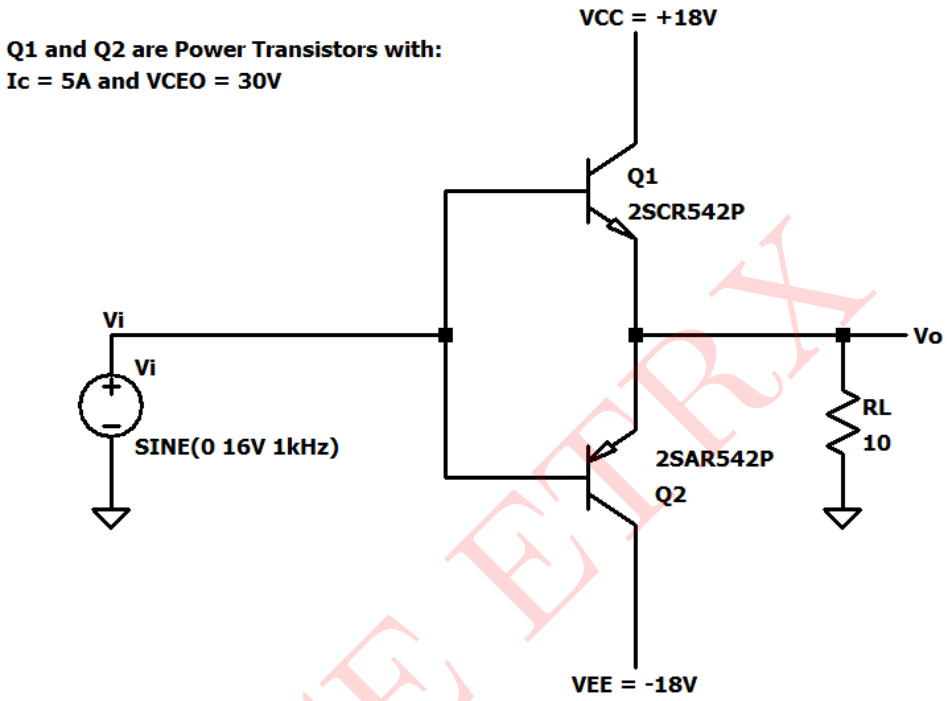

Figure 1: Circuit 1

Solution:

$$V_i = V_m \sin wt$$
$$= V_m \sin 2\pi ft$$
$$= 16 \sin 2\pi \times 1000t$$

$$V_m = 16V$$

$$P_{ac} = \frac{V_m^2}{2R_L} = \frac{16^2}{2 \times 10} = \mathbf{12.8W}$$

$$I_m = \frac{V_m}{R_L} = \frac{16V}{10\Omega} = \mathbf{1.6A}$$

$$P_{dc} = \frac{2V_{CC}I_m}{\pi} = \frac{2 \times 18 \times 1.6}{\pi} = \mathbf{18.334W}$$

$$\text{Efficiency } (\eta) = \frac{P_{ac}}{P_{dc}} = \frac{12.8W}{18.334W} \times 100$$

$$\eta = 0.698 = \mathbf{69.8}\%$$

SIMULATED RESULTS

The above circuit is simulated in LTspice and results are presented below:

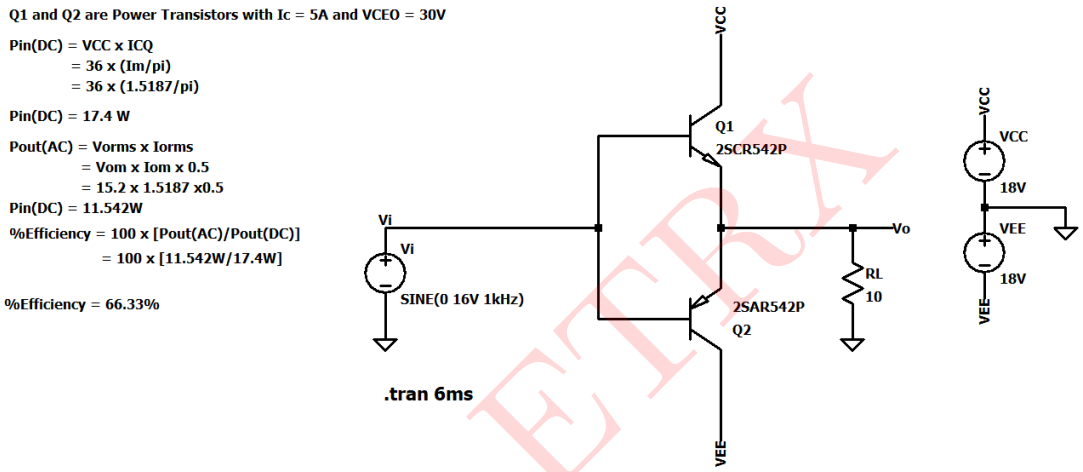

Figure 2: Circuit Schematic

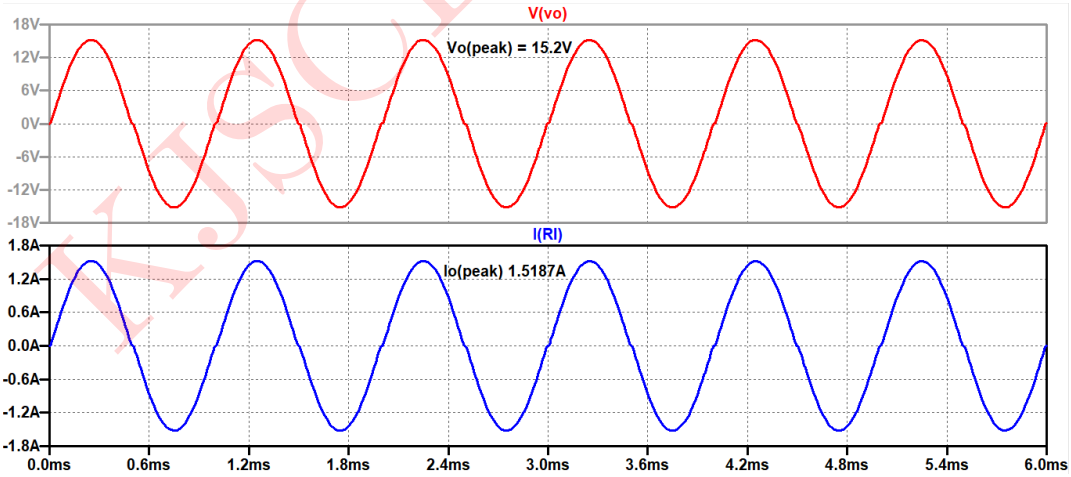

Figure 3: Output liad Voltage

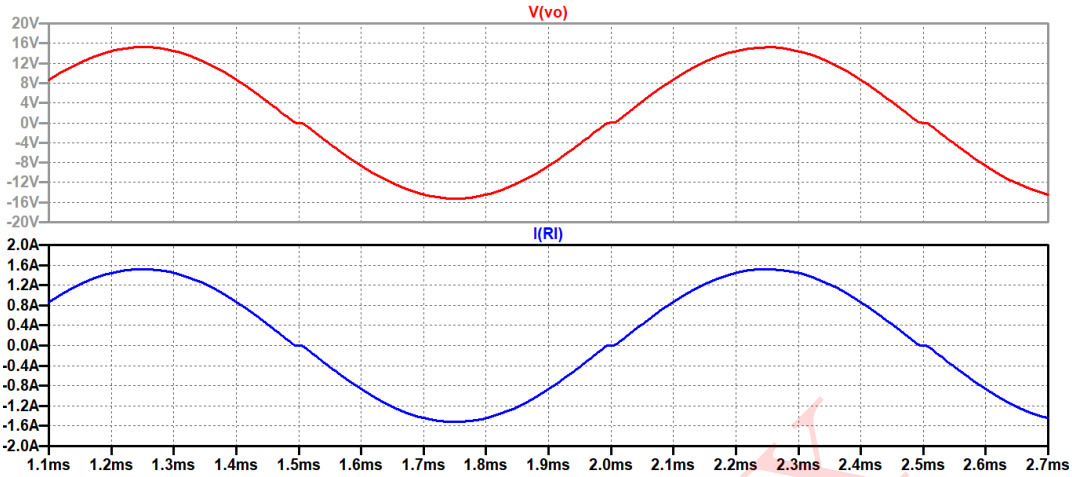

Figure 4: Cross over distortion

Comparison of Theoretical and Simulated results:

Parameters	Theoretical	Simulated
Input DC Power	18.334W	17.4W
Output AC Power	12.8W	11.542W
Efficiency	69.8%	66.33%

Table 1: Numerical 1

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