

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 is $8\ \Omega$, supply voltage $V_{CC} = 20\text{ V}$, $V_{EE} = -20\text{ V}$, AC input voltage is 18 V peak, frequency is 1000 Hz . Calculate the efficiency of the circuit.

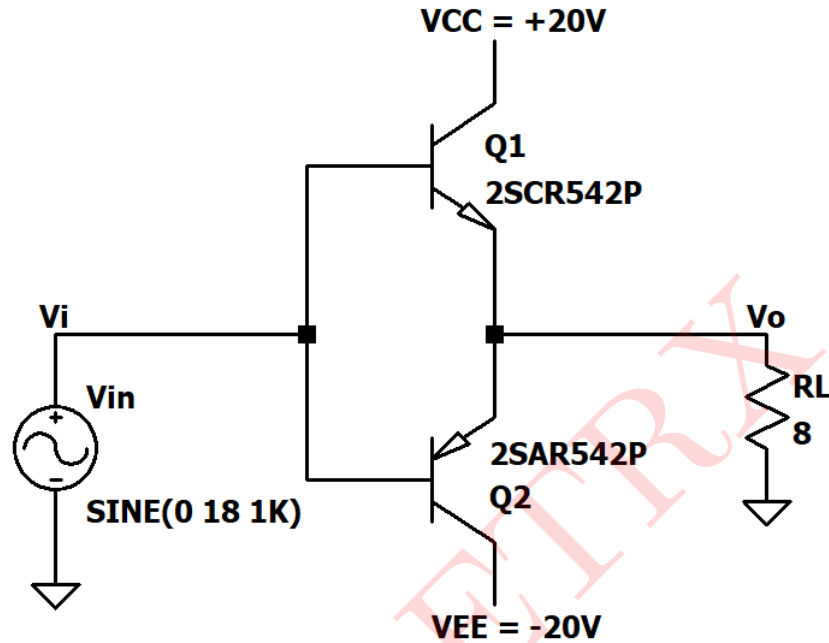


Figure 1: Circuit 1

Solution:

The given circuit is a class B power amplifier.

$$V_i = V_m \sin(\omega t)$$

$$V_i = V_m \sin(2\pi f t)$$

$$V_i = 18 \sin(2\pi \times 1000 \times t)$$

$$\therefore V_m = 18\text{ V}$$

$$P_o(AC) = \frac{V_m^2}{2R_L}$$

$$P_o(AC) = \frac{18^2}{2 \times 8} = 20.25\text{ W}$$

$$I_m = \frac{V_m}{R_L} = \frac{18}{8} = 2.25\text{ A}$$

$$P_i(DC) = \frac{2V_{CC}I_m}{\pi}$$

$$P_i(DC) = \frac{2 \times 20 \times 2.25}{\pi} = 28.64\text{ W}$$

$$\% \text{ Efficiency} = \frac{P_o(AC)}{P_i(DC)} \times 100$$

$$\% \text{ Efficiency} = \frac{20.25}{28.64} \times 100 = \mathbf{70.7 \%}$$

SIMULATED RESULTS:

Above circuit is simulated in LTspice. The results are presented below:

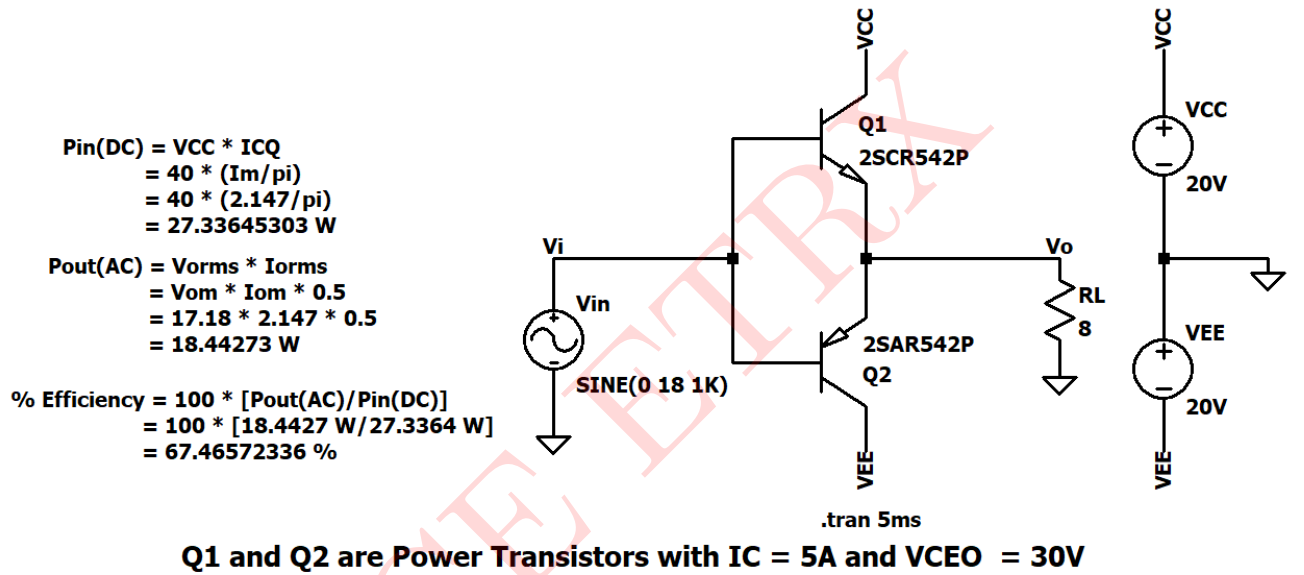


Figure 2: Circuit Schematic 1: Results

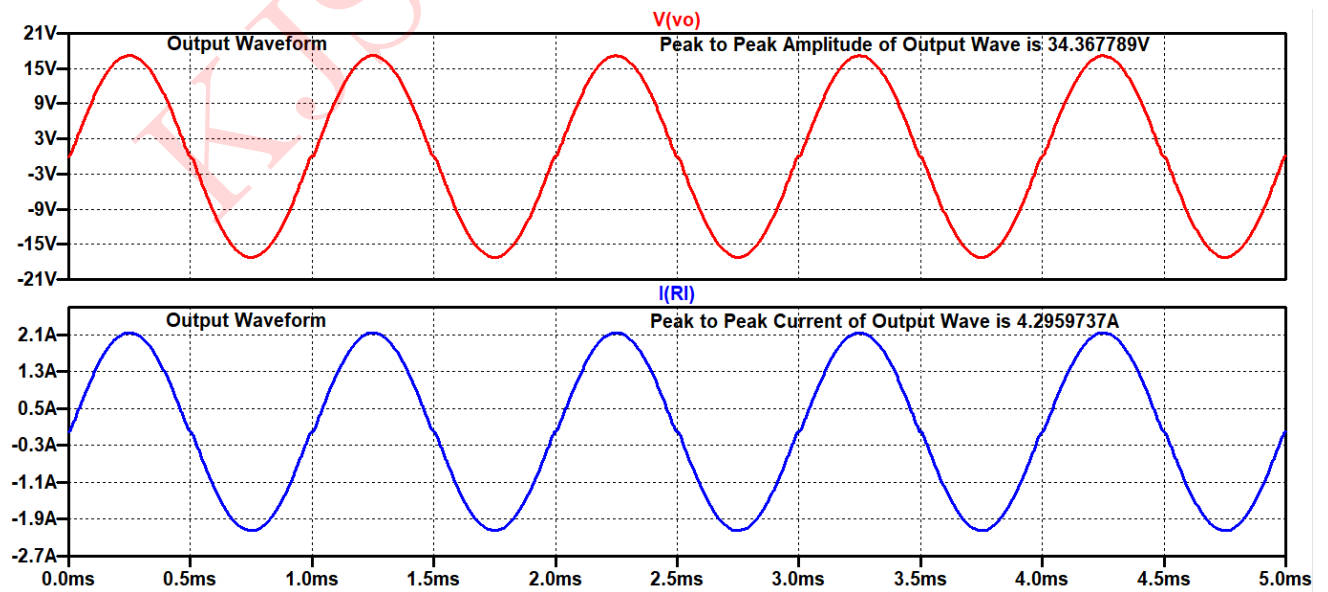


Figure 3: Input & Output waveforms

Comparison of theoretical and simulated values:

Parameters	Theoretical Values	Simulated Values
Input DC power	28.64 W	27.3364 W
Output AC power	20.25 W	18.4427 W
% Efficiency	70.7 %	67.4657 %

Table 1: Numerical 1

KJSCE ETRX