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

Numerical 1:
In a class AB push-pull amplifier, load $R_L = 10\Omega$, $R_1 = R_2 = 100\Omega$, supply voltage $V_{CC} = 20V$, $V_{EE} = -20V$, AC input voltage is 18V peak, frequency is 1000Hz. Calculate the efficiency of the circuit.

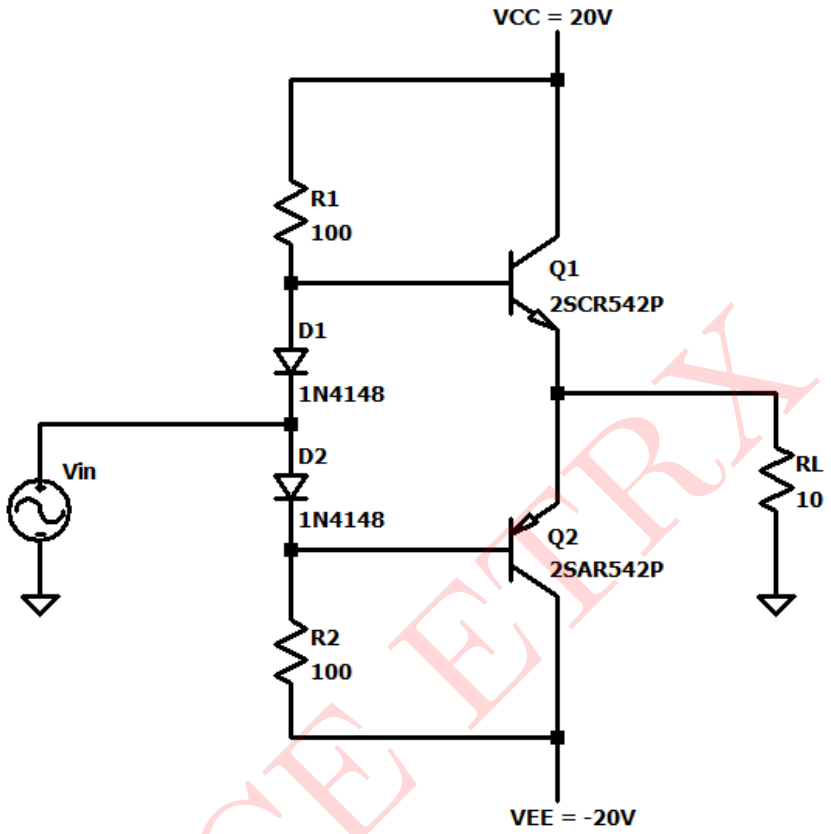

Figure 1: Circuit 1

Solution:

$V_m = 18V$

$\because P_{out}(ac) = \dfrac{{V_m}^2}{2R_L}$

$\therefore P_{out}(ac) = \dfrac{18V^2}{2 \times 10\Omega} = \mathbf{16.2W}$

$I_m = \dfrac{V_m}{R_L}$

$I_m = \dfrac{18V}{10\Omega} = \mathbf{1.8A}$

$P_{in}(dc) = \dfrac{2(V_{CC})(I_m)}{\pi}$

$P_{in}(dc) = \dfrac{2 \times 20V \times 1.8A}{\pi} = \mathbf{22.929W}$

Efficiency $(\eta) = \dfrac{P(ac)}{P(dc)}$

$$\therefore \eta = \frac{16.2W}{22.929W} = \mathbf{0.7065}$$

$\therefore$ Efficiency $(\%\eta) = \mathbf{70.65}\%$

SIMULATED RESULTS:

Above circuit is simulated in LTspice and results are as follows:

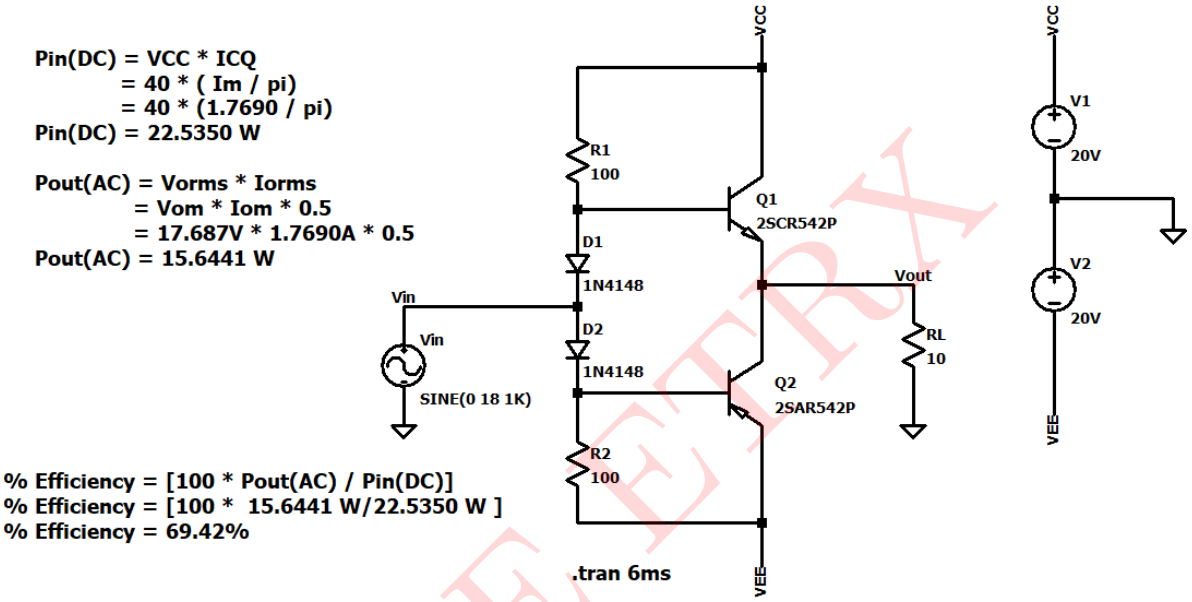

Figure 2: Circuit Schematic

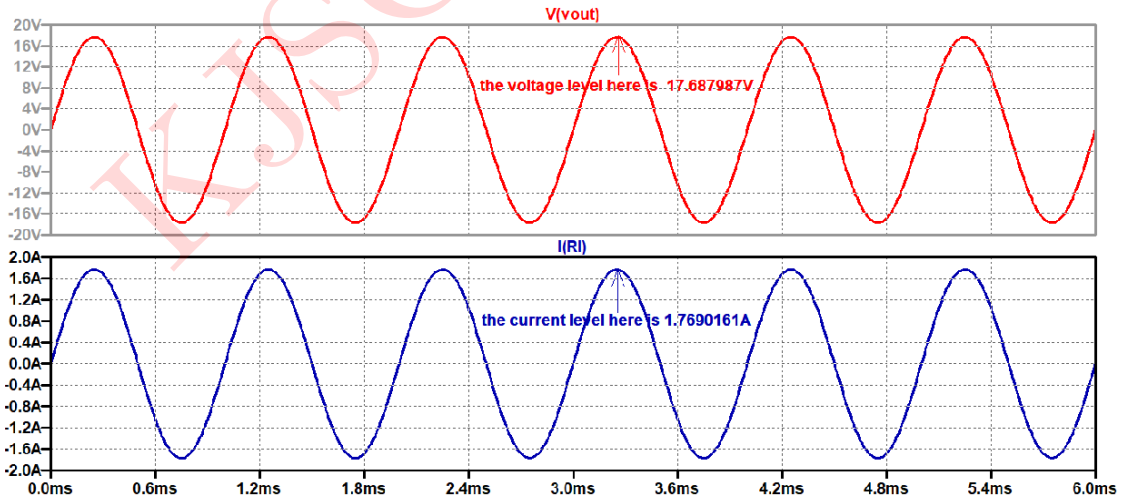

Figure 3: Output voltage and current waveform

Comparison between theoretical and simulated values:

Parameters	Theoretical values	Simulated values
Input DC power	22.929W	22.5350W
Output AC power	16.2W	15.6441W
Efficiency	70.65%	69.42%

Table 1: Numerical 1

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