NANYANG TECHNOLOGICAL UNIVERSITY
SCHOOL OF ELECTRICAL & ELECTRONIC ENGINEERING
EE4341/EE6341 ADVANCED ANALOG CIRCUITS
TUTORIAL 6

1. Fig. 1 shows a class-A power amplifier with a capacitor coupled load $R_L = 100\ \Omega$. The BJT has a current gain $\beta = 50$. The power supply $V_{CC} = +12$V and the BJT is to be biased at $V_{CEQ} = 6$ V. Assume $V_{BE} = 0.7$ V and $V_{CE,sat} = 0$ V for your calculation. Ignore the output resistance of the BJT and the reactance of coupling capacitors.
   (a) Determine the value of R_C for maximum possible conversion efficiency.
   (b) Calculate the DC biasing I_{CQ} and the value of R_B to provide the biasing.
   (c) Calculate the peak load voltage and current, and the conversion efficiency.

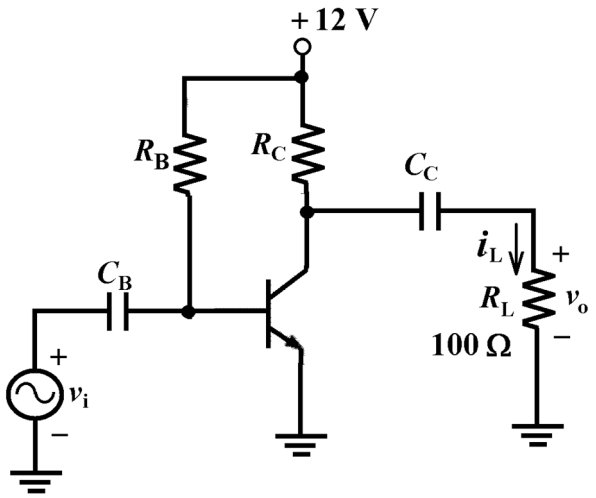

Figure 1

2. An emitter follower power amplifier with a load $R_L = 1$ kΩ is shown in Fig. 2. The transistor parameters are: $\beta = 200$, $V_{BE} = 0.7$ V and $V_{CE(sat)} = 0.2$ V.
   (a) Determine the value of R that will produce maximum possible output signal swing.
   (b) What is the value of I_Q and the maximum and minimum values of i_{E1} and i_L?
   (c) Calculate the conversion efficiency.

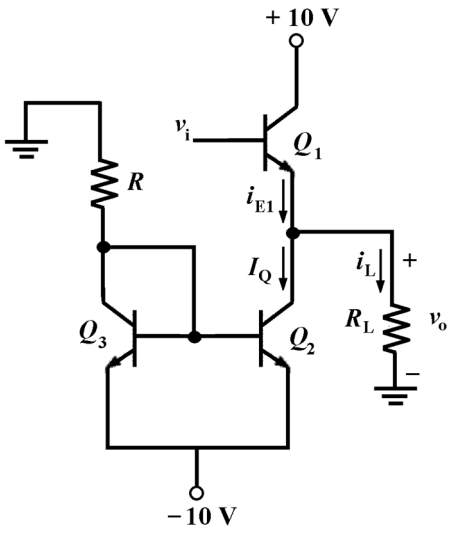

Figure 2

3. Consider a BiCMOS follower amplifier circuit shown in Fig. 3. The BJT parameters are: V_{BE} = 0.7 V and $V_{CE(sat)}$ = 0.2 V. The MOSFET parameters are: V_{TN} = −1.8 V and $K_n = \frac{1}{2}k_n'\left(\frac{W}{L}\right)$ = 12 mA/V^2.

(a) Determine the maximum and minimum values of output voltage and the corresponding values of input voltage for the amplifier to operate in the linear region when:

(i) R_L is removed (open-circuit)

(ii) R_L = 500 Ω

(b) Determine the smallest possible value of R_L if a 2 V peak sine wave is produced at output. What is the corresponding conversion efficiency?

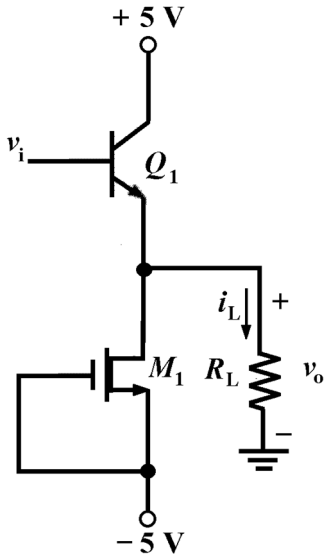

Figure 3