1. 20% Assuming $V_{in} = V_P \sin \omega t$, plot the output waveform of the circuit depicted in Fig. 1 for an initial condition of +0.5V across C_1. Assume $V_P = 5$V.
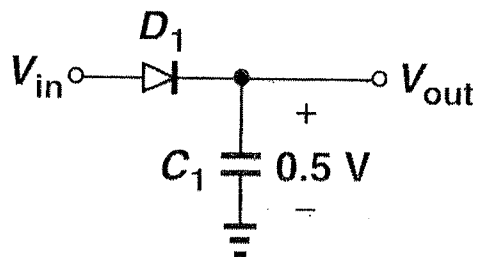

Fig. 1

2. 20% Find the emitter, base, and collector voltages and currents of the following circuit. Use $\beta = 30$, but assume $|V_{BE}| = 0.7$V independent of the current level.
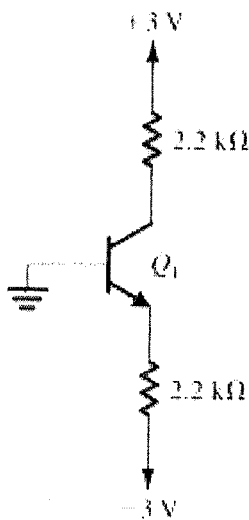

Fig. 2

3. 20% In the BJT, please present the parameters of g_m, r_π, and r_o in terms of I_C, β, V_T, and V_A.

4. 20% A Common-Emitter (CE) amplifier utilizes a BJT with $\beta = 100$ biased at $I_C = 0.5$mA and has a collector resistance $R_C = 10$ kΩ and a resistance $R_e = 150$Ω connected in the emitter. Find R_{in}, $A_{vo} = v_o/v_i$, and R_o. Assume $V_A = \infty$.
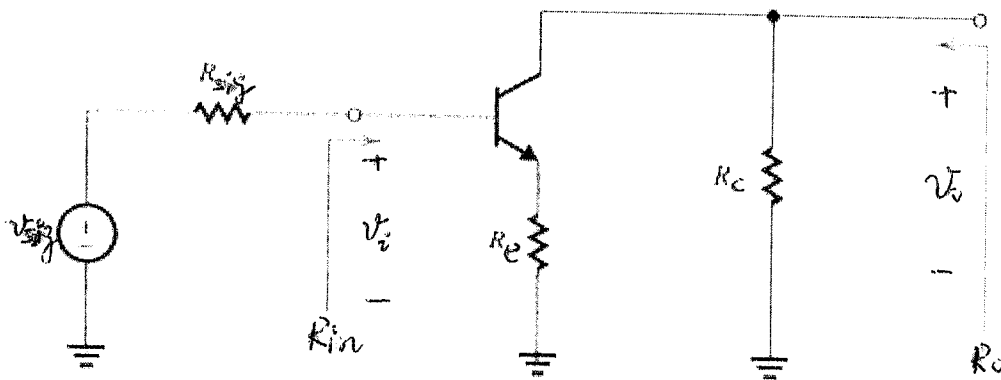

Fig. 4

5. 20% An emitter follower with a BJT biased at $I_C = 1$ mA and having $\beta = 100$ is connected between a source with $R_{sig} = 20$ kΩ and a load $R_L = 1$ kΩ. Find R_{in}, v_b/v_{sig}, and v_o/v_{sig}.
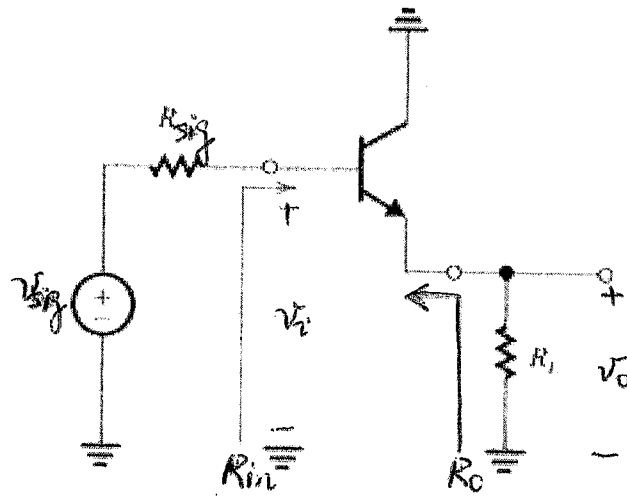

Fig. 5