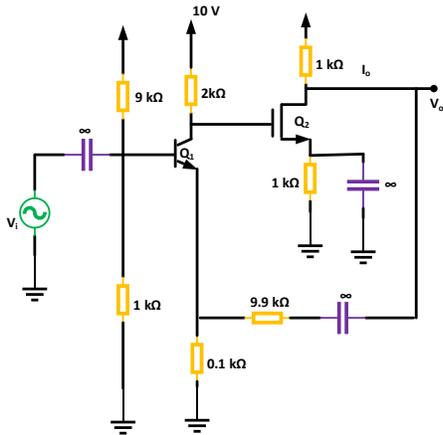


ECGR 3132: Electronics

Breadth Exam

Name:-----



Q: The circuit given in Figure 1 has the following parameters:

$$K_n = 0.25 \frac{mA}{V^2}, V_T = 1 V; \beta = 100, V_{BE} = 0.7 V.$$

Use: $I_D = K_n(V_{GS} - V_T)^2$, and

$$g_m(MOS) = 2K_n(V_{GS} - V_T).$$

Ignore base current.

Figure 1:

- (i) Calculate: $Q_1: (V_{CEQ}, I_{CQ})$ **(10 Points)**
- (ii) Calculate: $Q_2: (V_{DSQ}, I_{DSQ})$ **(10 Points)**
- (iii) Identify the topology **(5 points)**
- (iv) Identify the B-Circuit to calculate $A_{vf} = \frac{v_o}{v_i}$. **(5 Points)**
- (v) Using the topology method find R_1, R_2 and B. **(15 Points)**
- (vi) Draw the small-signal equivalent circuit and find $A_{vf} = \frac{v_o}{v_i}$. **(30 Points)**
- (vii) Find $A_{vf} = \frac{v_o}{v_i}$ using the T-method. **(20 Points)**
- (viii) Compare results of (v) and (vi), if different, why? **(5 Points)**