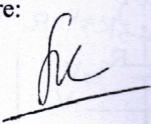
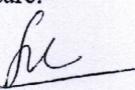


Final Examination

Date: January 13, 2018

Duration: 120 minutes

SUBJECT: Electronic Devices	
Dean of School of Electrical Engineering Signature:  Full name: Tran Van Su	Lecturer: Tran Van Su, M.Eng. Signature:  Full name: Tran Van Su

INTRODUCTIONS:

1. Only one NOTE of A4-size paper and calculators are allowed during the exam. Books, other materials, and computers are prohibited.
2. Answer all questions.

Question 1 (25 Marks)

$V_{cc} = 12 \text{ V}$, $R_2 = 3.1 \text{ k}\Omega$, $R_1 = 22 \text{ k}\Omega$, $R_E = 750 \Omega$, $R_C = 4.3 \text{ k}\Omega$ and $\beta = 90$. (Neglect r_o)

- Calculate the quiescent point of transistor Q (I_{CQ} and V_{CEQ}). (5 Marks)
- Sketch the AC small-signal equivalent circuit. (5 Marks)
- Find input impedance R_{in} and output impedance R_o . (3 Marks)
- Find the voltage gain $A_v = v_o/v_s$. (5 Marks)
- If the input signal (v_s) has the internal resistance of R_s . Compute R_s to obtain a half of voltage gain obtained in question d. (5 Marks)
- If the resistor R_E cannot be bypassed by the capacitor C_2 (without C_2), the voltage gain increased or decreased? (Do not compute, just comment the reason). (2 Marks)

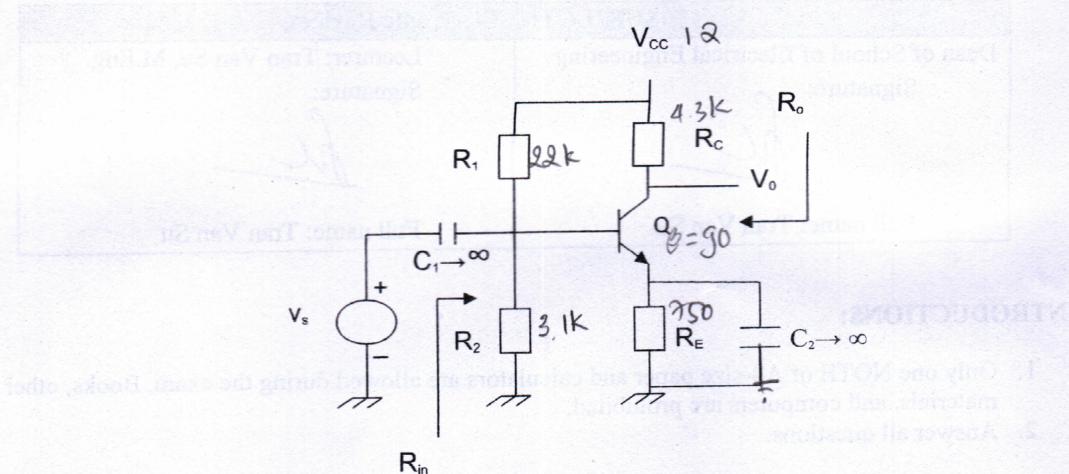


Fig. 1

Question 2 (25 Marks)

$V_{cc} = 12 \text{ V}$, $R_b = 12 \text{ k}\Omega$, $R_s = 0.5 \text{ k}\Omega$, $R_L = 1.2 \text{ k}\Omega$, early voltage $V_A = 50 \text{ V}$, and $\beta = 100$.

- Calculate the quiescent point of transistor Q (I_{CQ} and V_{CEQ}). (5 Marks)
- Sketch the AC small-signal equivalent circuit. (5 Marks)
- Calculate input impedance R_{in} and output impedance R_o . (5 Marks)
- Find the voltage gain $A_v = v_o/v_i$. (5 Marks)
- Find $A = i_L/v_b$. (5 Marks)

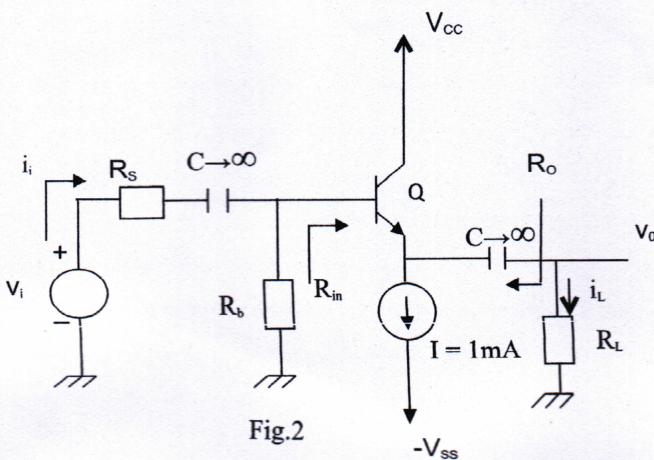
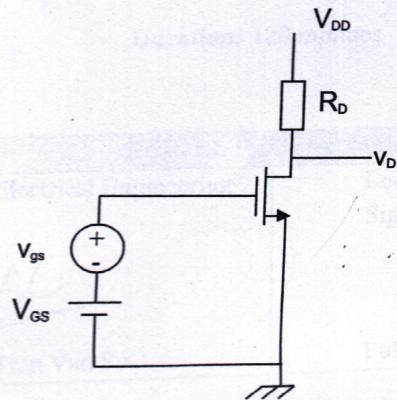


Fig. 2

Question 3 (25 Marks)

$V_t = 2V$, $k_n W/L = 2mA/V^2$, $V_{DD} = 12V$, $R_D = 0.5k\Omega$, $V_{GS} = 5V$.

- Calculate I_D and V_D . (10 Marks)
- For V_{peak} (sinusoid), what is the total variation in the drain current? (10 Marks)
- Plot input and output waveforms of the voltage. (5 Marks)



Question 4 (25 Marks)

$R_G = 620 k\Omega$, $R_D = 5 k\Omega$, $R_{sig} = 10 k\Omega$, $R_L = 1 k\Omega$, $R_s = 0.5 k\Omega$, and $g_m = 0.002 S$. (Neglect r_o)

- Plot the AC small-signal equivalent circuit. (5 Marks)
- What are the input and output impedances R_{in} and R_o . (5 Marks)
- Find the voltage gain $A_v = v_o/v_i$. (10 Marks)
- Find R_s to obtain voltage gain of 1. (5 Marks)

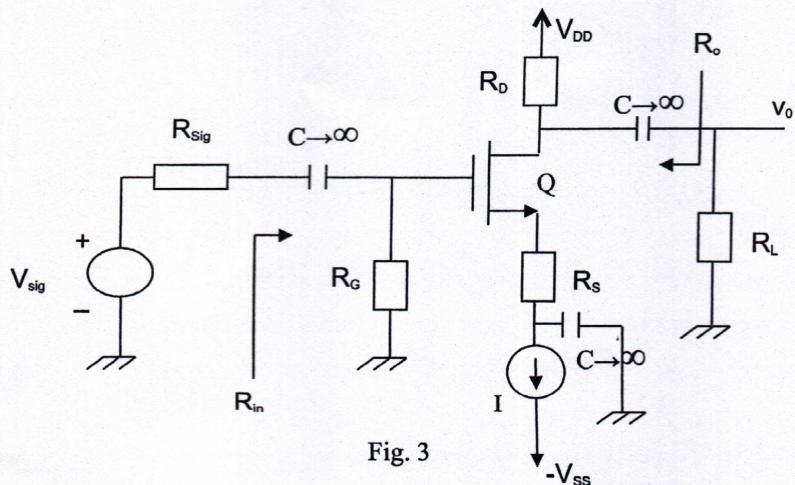


Fig. 3