Electronics II

Frequency analysis

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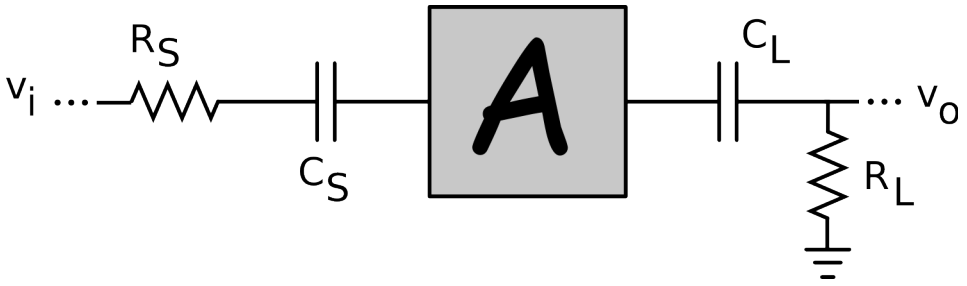
MIEET 3º ano

1)

A certain commercial amplifier has the following parameters

- Voltage gain: $A = -100$ V/V.
- Input resistance: $r_{in} = 5$ kΩ.
- Output resistance: $r_{out} = 1$ kΩ.
- Capacitance between the input and output: $C_f = 10$ pF.
- Capacitance between the input and the box (ground) and the output and the box (ground): $C_i = C_o = 10$ pF.

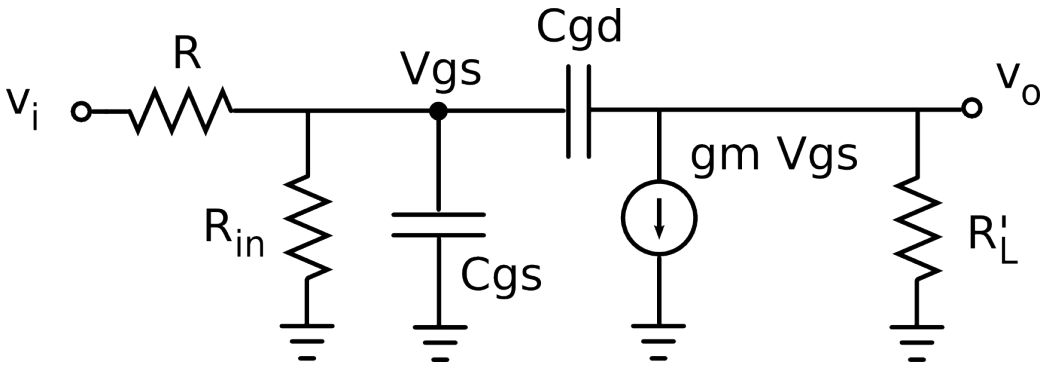
Based on this amplifier the following circuit was designed



$R_S = 1$ kΩ, $R_L = 3$ kΩ, $C_S = C_L = 10$ μF.

a) Determine the mid-frequency gain of the complete circuit.
b) Schematically draw Bode plots of the behavior of the circuit in terms of frequency.
c) Determine the band-width of the circuit.

2)



The figure above shows an equivalent circuit of an common-source FET amplifier. The input signal comes from a signal generator with an output resistance R. R_{in} represents the input resistance of the FET stage and is caused by the gate-bias resistances. R_L' is the parallel equivalent resistance composed

of load R_L, drain resistance R_D and FET output resistance r_o. Capacitors C_{gs} and C_{gd} are internal capacitors of the FET.
R = 100 kΩ, R_{in} = 420 kΩ, C_{gs} = C_{gd} = 1 pF, g_m = 4 mA/V, R_L' = 3.33 kΩ.

a) Determine the mid-band gain, $A_v = v_o/v_i$.
b) Determine the bandwidth of the circuit.