EEE 411/511 Midterm

Dec 2, 2003 18.00

(150 minutes)

Q.1

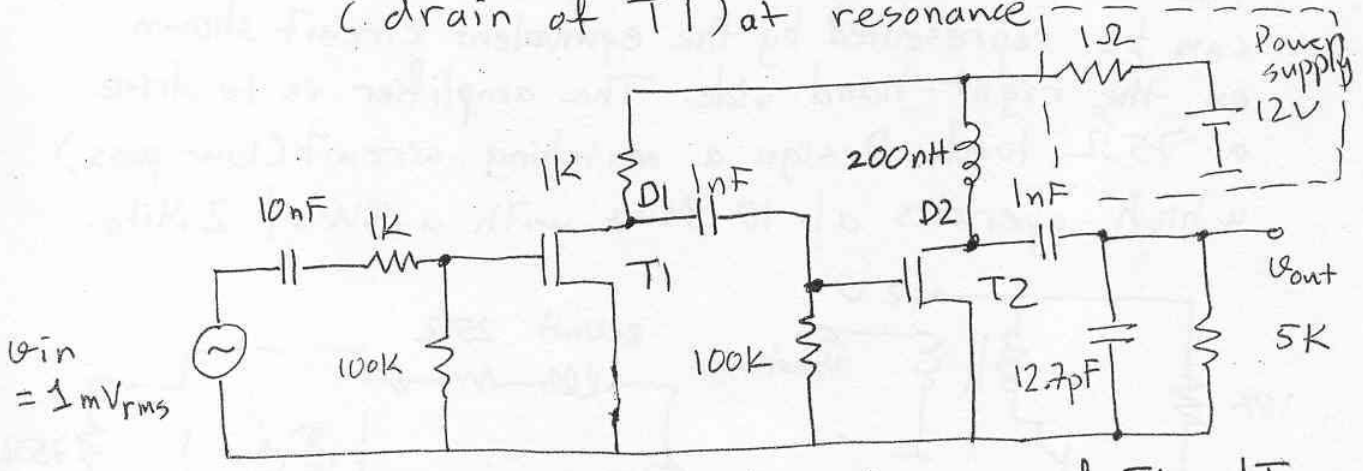
A two stage with a second tuned stage has been constructed as shown below. The equivalent circuit of the power supply has a 1Ω series resistance unfortunately due to long transmission line and improper power supply decoupling.

a-)(12p) Assume that:

I. The 1Ω series resistor does not load the tank

II. The power supply feedback at D1 is not amplified by T2,

Find the power supply feedback voltage at D1 (drain of T1) at resonance.

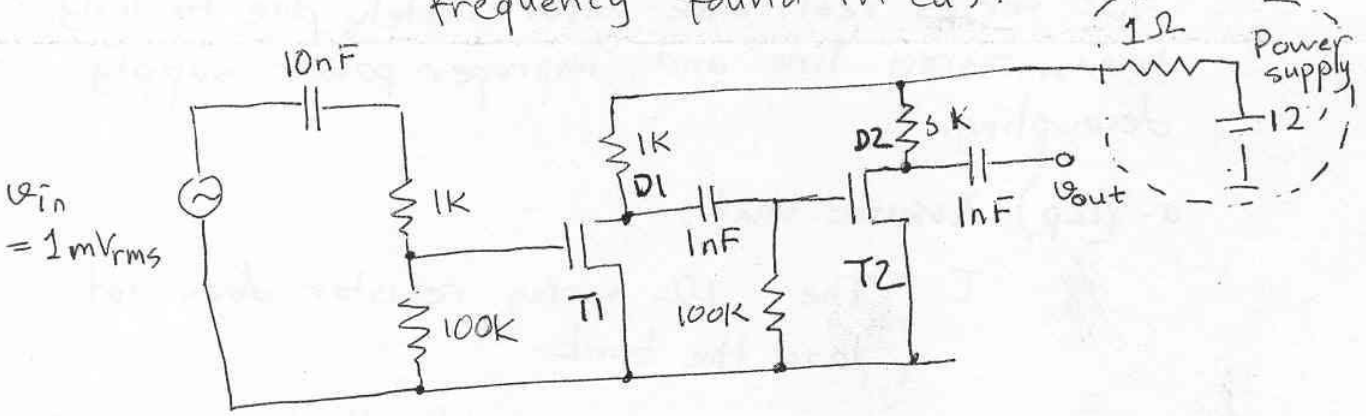


(Biasing is not shown)

$C_{gd} = 0$, $C_{gs} = 0$

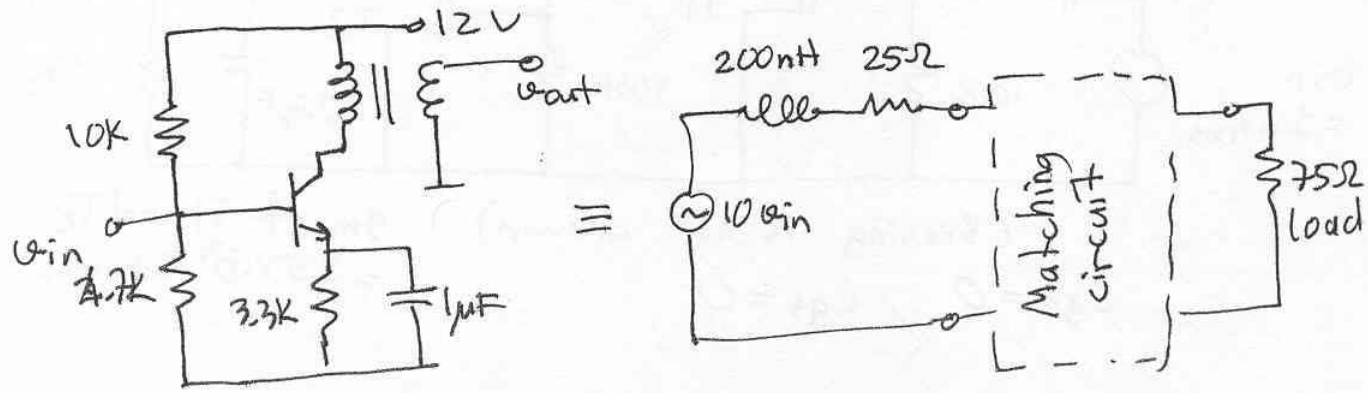
g_m of T1 and T2 $= 25 \times 10^{-3}$ Siemens

b-)(10p) The tuned circuit at the output stage is now replaced by the single 5K resistor (5K) as shown below. Now find the power supply feedback voltage at D1, the same assumptions as in (a) are still valid and at the same frequency found in (a).



Q.2 (18p)

The output of the BJT amplifier shown below can be represented by the equivalent circuit shown on the right-hand side. The amplifier is to drive a 75Ω load. Design a matching circuit (low-pass) which operates at 10 MHz with a BW of 2 MHz.



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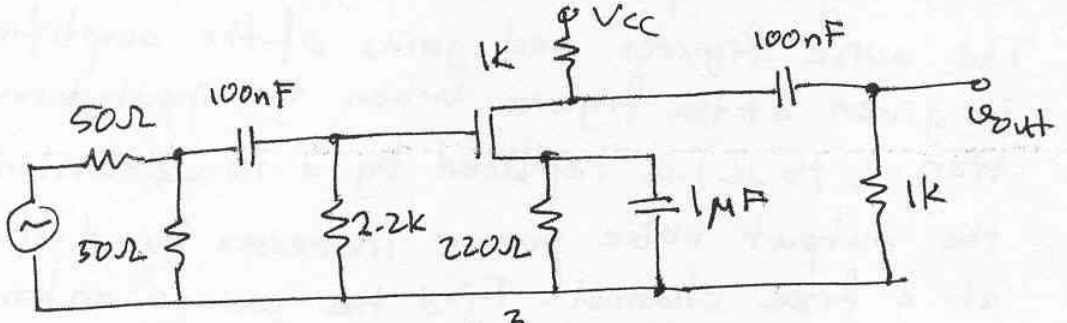
Q. 3 (15p)

For the circuit given below, estimate the lower cut-off frequency. Quote the result in Hz.



$g_m = 25 \times 10^{-3}$ Siemens

$C_{gd} = 3pF$

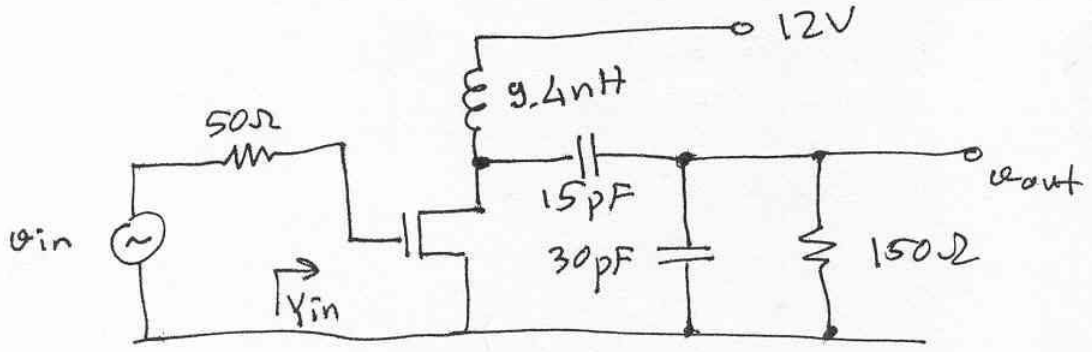
$C_{gs} = 12pF$

Q-4

For the amplifier drown below:

a-)(15p) Find the center frequency

b-)(12p) Find the gain at the center frequency.



(Biasing not shown)

$R_g = 5\Omega$

$g_m = 12 \times 10^{-3}$ Siemens

$C_{gd} = 2 \times 10^{-12}$ F

$C_{gs} = 4 \times 10^{-12}$ F

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Q.5 (18p)

The input of a cascaded amplifier which has 75Ω input impedance is terminated by 75Ω. The noise figures and gains of the amplifier is given at the figure. When the input termination (75Ω) is replaced by a 75Ω-antenna, the output noise power increases by 6 dB at a free channel. Find the excess antenna noise in terms of kT_oB.