

EEE313 FINAL – 25 May 2005 15.30

150 minutes

This is an open-book exam. Cheat-sheet or any other form of sheet is not allowed and the existence of any sheet will be treated as cheating.

Use the question sheet for your answers. You can use the backsides of the sheets if necessary.

Please write down your answers in sufficient detail to show your method. State the name of the method you used or explain it. Unintelligible answers will not be graded. Please take care to finalize your calculations.

Draw and label your circuit at each question, show the directions of currents and the polarity of voltages as necessary.

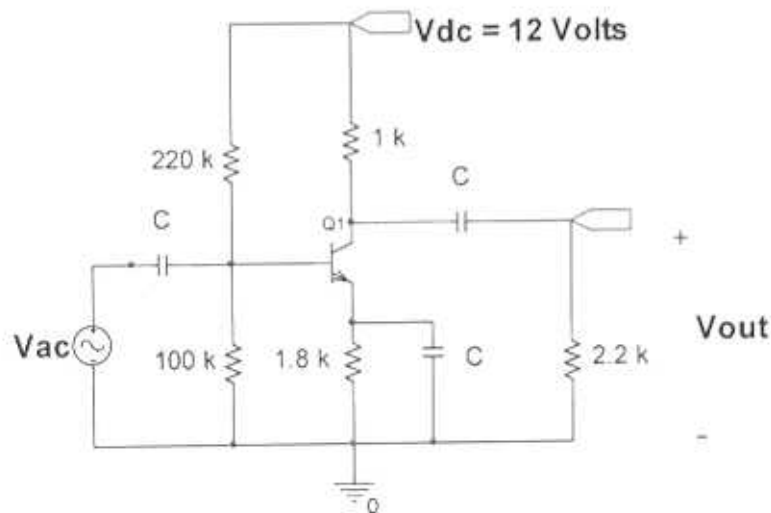
Do not give multiple answers, they will not be graded.

You can use calculators. Exchanging calculators, pencils, erasers, etc. is not allowed.

Cellphones are not allowed.

Questions must be asked personally in a low voice without other students hearing it.

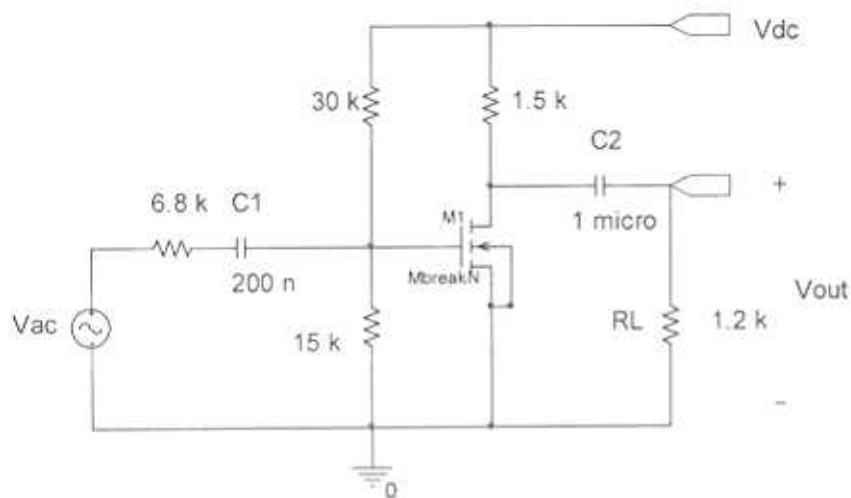
QUESTION 1 (points) :



$V_{\gamma} = 0.75 \text{ Volts}$, $\beta = 99$

Find the DC bias of the transistor (All the voltages and currents of the transistor).

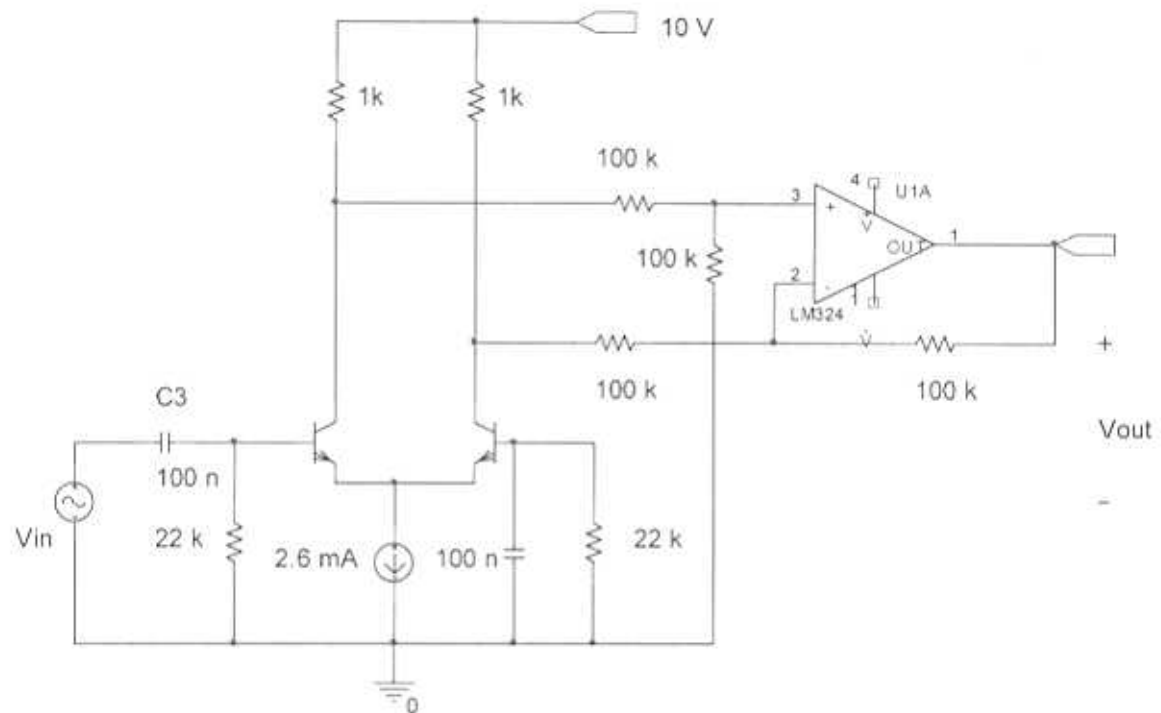
QUESTION 2 (points) :



At the circuit above the following transistor parameter is given, $K_n = 2 \text{ mA/V}^2$. The transistor is an N channel MOSFET device. It is biased by adjusting the DC voltage source such that the transistor current is 2 mA and it is in saturation region. Please find:

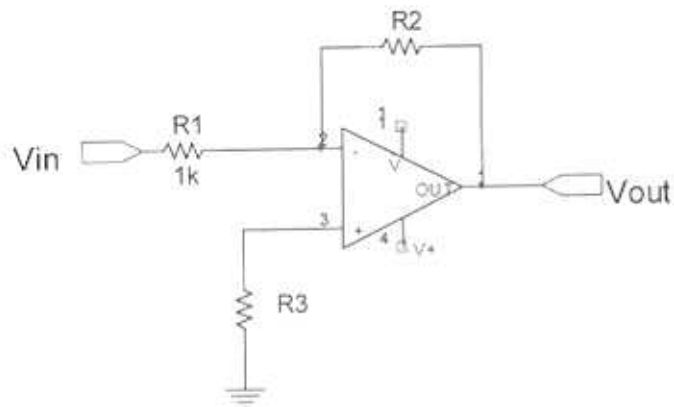
- the midband gain of the amplifier,
- the lower 3 dB cut-off frequency defined by C1 and C2.

QUESTION 3 (points) :



For the circuit above, find the gain of the amplifier in dB's (Hint: Neglect the loading caused by the 100 K resistors on the transistor collectors).

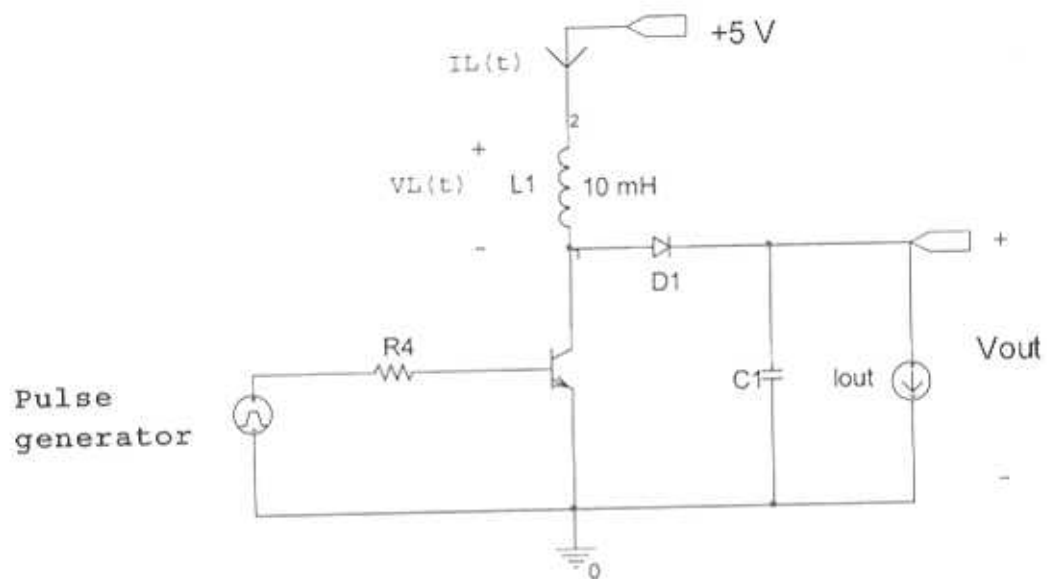
QUESTION 4 (points) :



The input offset voltage of the op-amp is 0.1 mV . The input bias current is not known. The gain of the circuit is 60 dB . Please answer the following:

- Find the output offset voltage and the value of R_2 .
- Find the value of R_3 which minimizes the output offset voltage.
- The amplifier is to be operational at the frequency range 0 to 10 kHz . Put a limit on the gain of the op-amp at this frequency range.

QUESTION 5 (points) :



The voltage and the current waveforms of the switching convertor shown above is given at the figure below. The output voltage V_{out} is 9 Volts. The transistor and the diode can be assumed to be ideal. The period T_1 is 100 microseconds.

- Find T_2 ,
- Find T to make $I_{out} = 20$ mA.

