

## Analog Electronics, Short written exam 2 (2)

Mid Sweden University, Sundsvall 071029, 3 hours

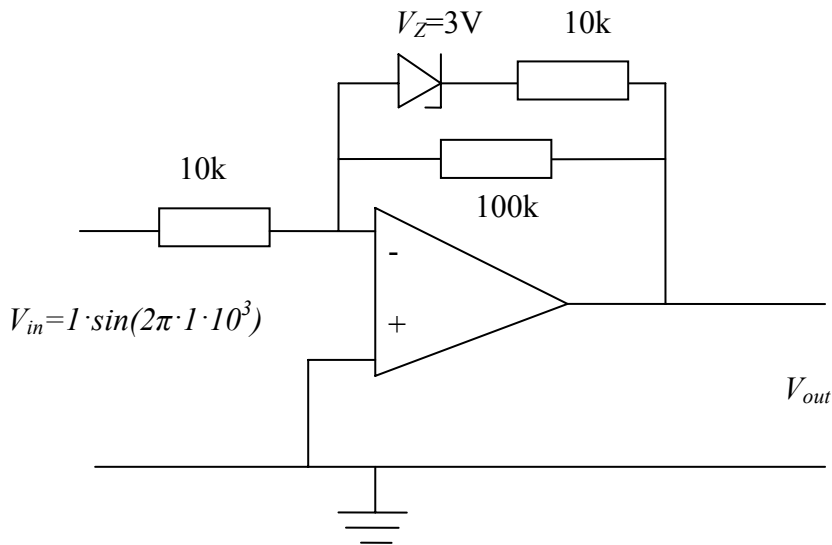
Allowed accessories: Calculator, Any “pure” book of formulas – No textbook with solution allowed.

Preliminary grading

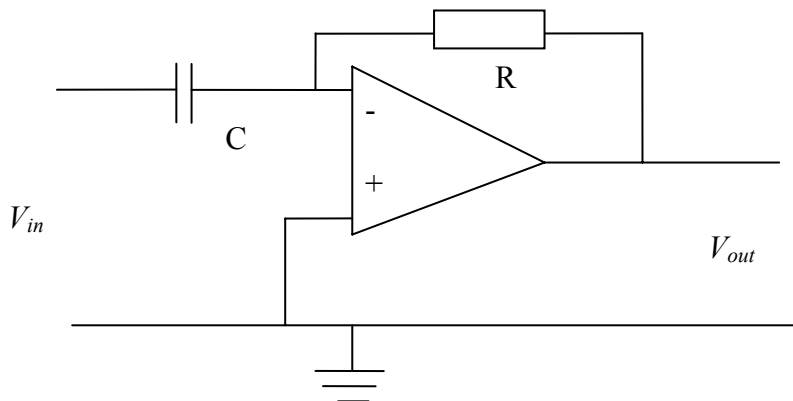
Unsatisfactory:	<9
Satisfactory:	≥9
Good:	≥13
Very Good:	≥16

The solution should be clearly written and easy to follow. All assumptions should be written down.

1. Draw  $V_{in}=f(t)$  and  $V_{out}=f(t)$  in the same graph and  $V_{out}=f(V_{in})$  in a separate graph for the following circuit. (4p)

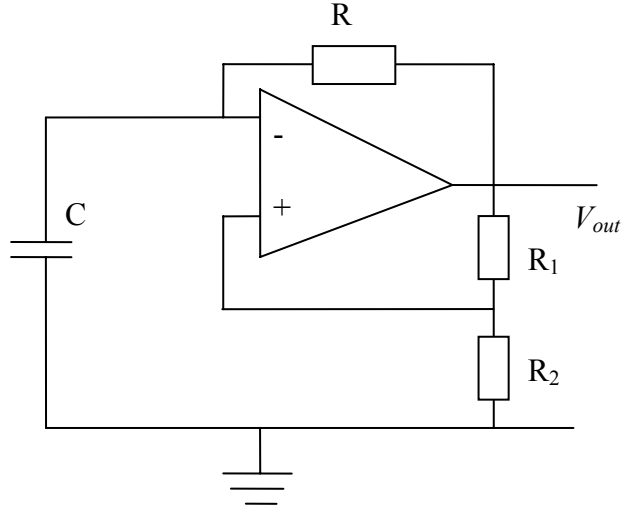


2. Derive an expression for  $V_{out}=f(V_{in})$  for the following circuit. Use the relation for current in a capacitor  $I_C = C dV/dt$ . What is the function of the circuit? (4p)



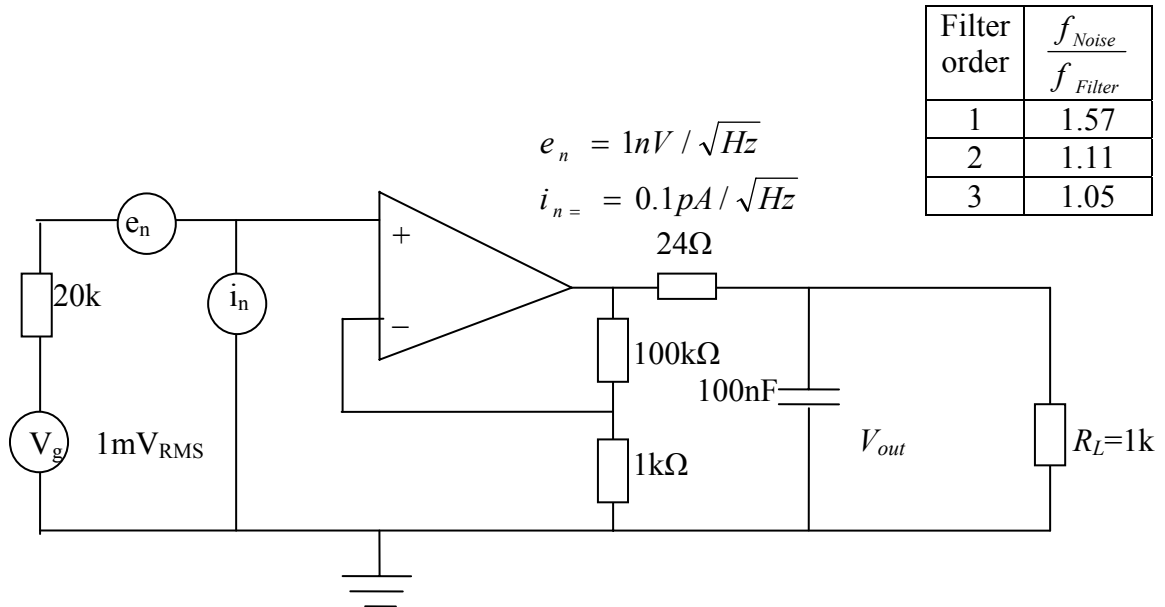
3. Multivibrator

- a. Explain how the multivibrator (oscillator) in the figure works? (3p)
- b. Explain the influence of the resistors  $R_1$  and  $R_2$  (1p)
- c. Explain the influence of the RC network R and C (1p)



4. An amplifier is used for amplification of pulses of  $1\text{mV}_{\text{RMS}}$  from a photodiode and the spectral information in the pulses reaches from 45-50kHz.

- a. Calculate the signal to noise ratio SNR for the following amplifier where the noise sources have been added in the schematic. (4p)
- b. Suggest a simple solution for improving SNR and estimate how much better SNR (1p)



Good Luck  
/Kent