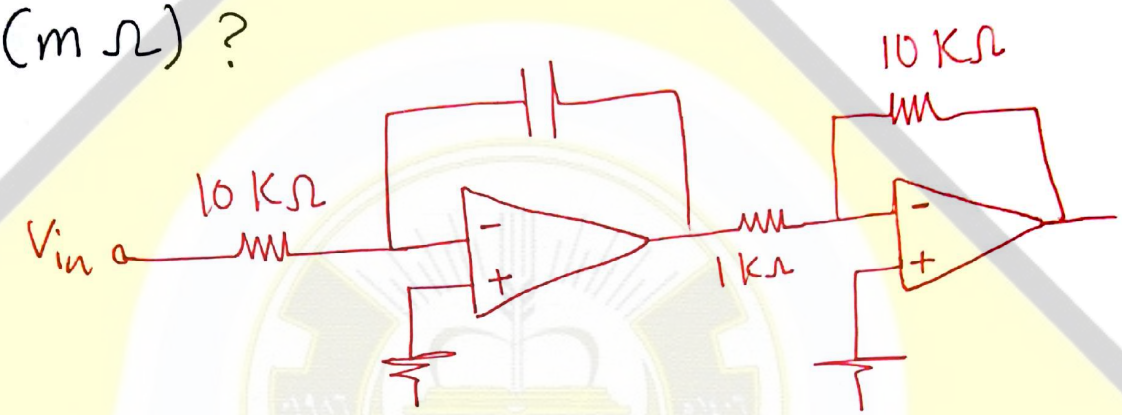
First exam - Instrumentation - Summer 201

Q1 (multiple choice).

1- Sensor resolution when the offset $V_{ab} = 3V$ is (m Ω)?



-fig. 2-

2- 5 bit ADC with $V_{Ref} = 10V$, $V_{in} = 0V$, then the digital value of the input is ?

3- if $C = 10\mu f$, initialy uncharged and $V_{in} = 10V$, then V_{out} after 2 ms will be in fig 2 ?

4- one of the following is not a systemetic error?

. nearby short circuit : الدائرة

Q2 (essay).

Ameter reads current through R of 30 mA with accuracy of ±1.5% at full scale of 150 mA, R is measured as 45.05 Ω. Consider only 5.f.

A- Find the voltage across R with worst case uncertainty expressed in V.

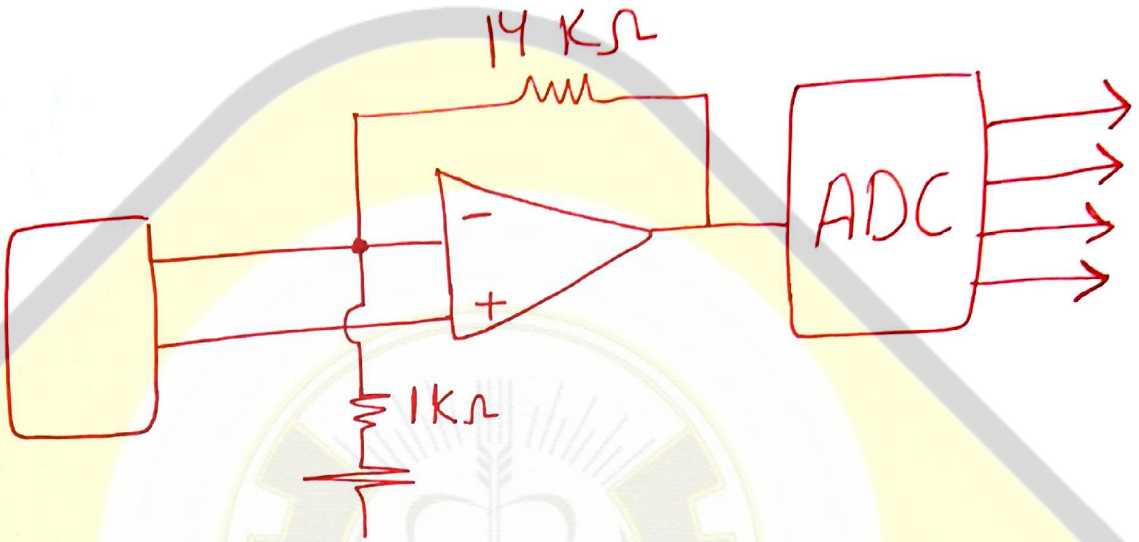
B- Use RMS representation to find the Parcentage uncertainty in V across R.

Q2 (essay).

measornment of temperature, using asensor that outputs 10 mV/C°, using 4 bit ADC with 5V reference in the circuit.

A- what is the maximum temperature the circuit is designed to measure?

B- if the output is 1010, what is the temp. range at this reading?.



Q4 (essay).

Sensor resistance varies linearly from 5→15 (KΩ) as a variable change from minimum to maximum value for this sensor.

A- design signal condition system that provides an output voltage varying linearly from -5→5V as sensor changes from min. to max. Use non inverting and differential amplifier.

- dont use follower -, use 1KΩ value for all fixed R in design.

B- Enter the output obtained from the Previous circuit to a hystresis Comparitor that will go high (5V) when the R is greater than 10 KΩ ± 1 %.

C- Calculate the Power dissipated in the Sensor. when the output is 0 V. (bonus).