The University of Nottingham

Worksheet 5 – MM2EMD Analog electronics and operation amplifiers.

Q1. Draw and explain how an accelerometer works.

Q2. Accelerometers are always used with an op-amp circuit – why is this?

Q3. In the notes we derive an equation relating the acceleration an accelerometer experiences to the output of an integrating op-amp circuit. Device this equation your self. I suggest you start by reading the notes, then make notes on the derivation. Then see if you can write out the derivation from memory. In an exam I would not ask you to produce the whole derivation but I may ask you about some of the key assumptions made in the derivation.

Q4. Draw an amplifier circuit that could be used with a wheatstone bridge. Write down the equation relating the potential developed across the wheatstone bridge to the output of the amplifier circuit.

Q5. A wheatstone bridge develops a potential of 0.01V, an amplifier circuit attached to the bridge has $R_1=R_2=10kOhm$ and $R_f=R_g=100kOhm$.   What will the output voltage of the amplifier circuit be?

Q6. Derive the equation you used in question 5 – use your notes to help you.
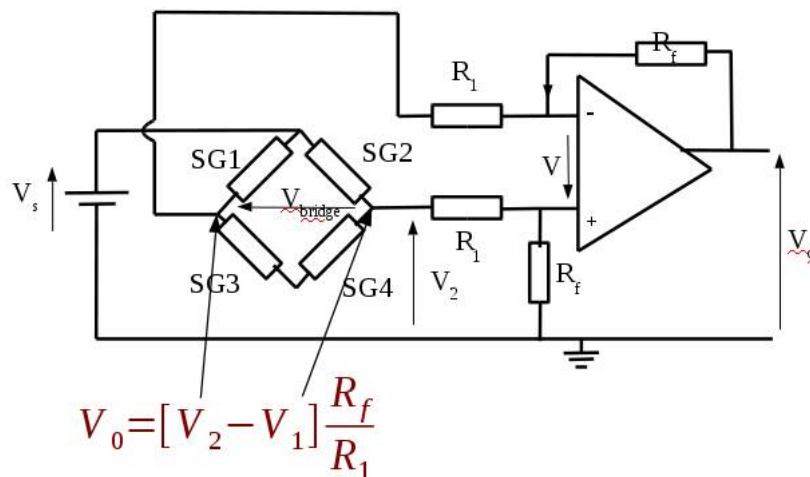
Answers

Q1.
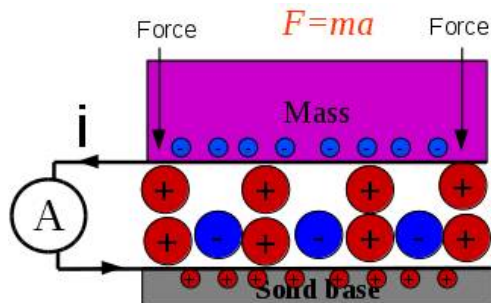
The mass squashes the quartz crystal which produces current.

Q2. Accelerometers develop a very small current, also the output is not proportional to the acceleration. (See notes for more details.)

Q3. See notes.

Q4.

$$V_0 = [V_2 - V_1]\frac{R_f}{R_1}$$

Q5.

$$V_0 = [V_2 - V_1]\frac{R_f}{R_1}$$

$$V_0 = [0.01]\frac{100}{10}$$

$V_0 = 0.1$ V

Q6. See notes.