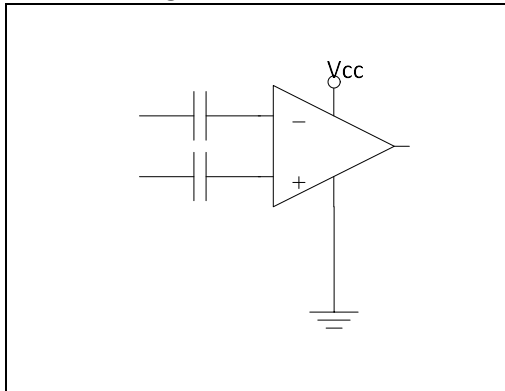


Analog Peripherals of Digital Systems - Problems

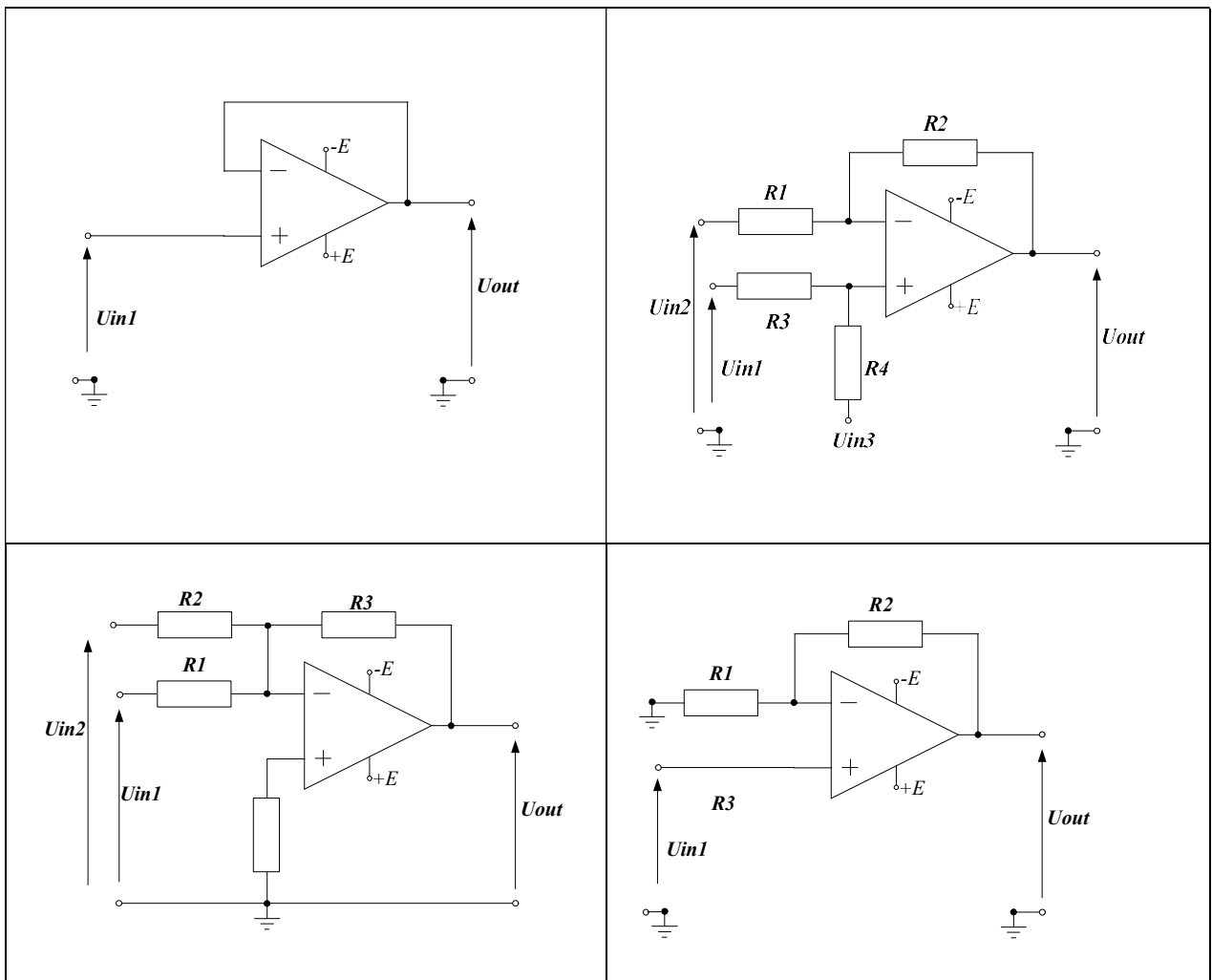
ELECTRONIC Circuits

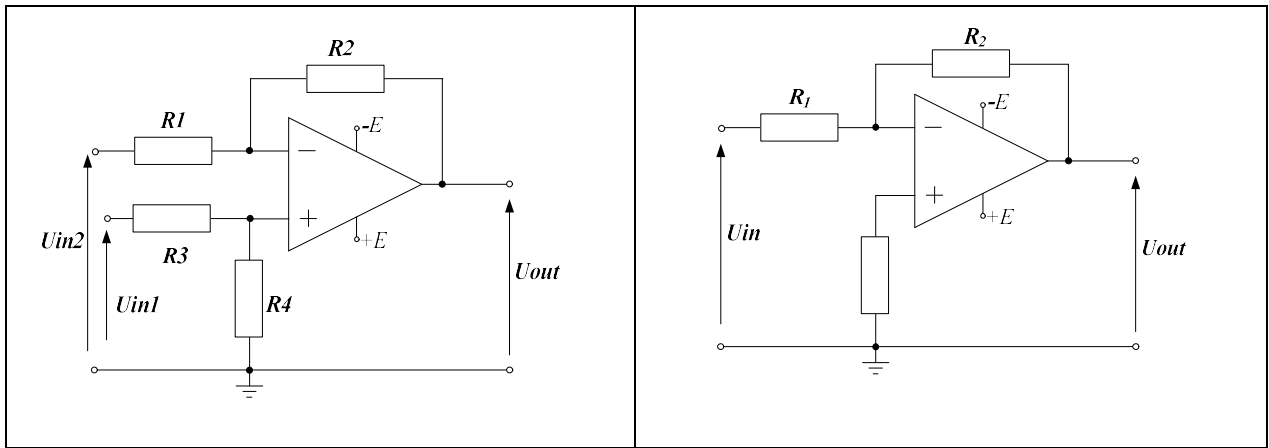
Measurement circuits and systems

1. Draw the two basic diagrams of a instrumentation amplifiers
2. Compare instrumentation vs. operational amplifier
3. What is wrong with the circuit ?



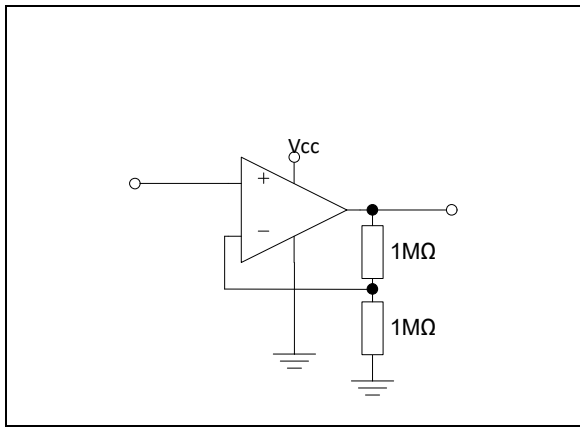
4. Calculate unknown voltage (if other voltages and resistors are specified):





Front-end circuits

- The amplifier is designed to transmit a video signal using a "current coupled amplifier". What's wrong with that?



- What are VV, CC, CV, VC operational amplifiers?
- What is the idea of a charge amplifier?
- What is the idea of a chopper amplifier?
- What is the idea behind a parametric modulated amplifier?

PLL

- Explain the concepts of "hold frequency" and "capture frequency" in PLL
- What is the PLL working principle?
- What is the principle of operation of a PLL as an FM detector?
- What is the principle of operation of a PLL as an AM detector?
- What is the principle of operation of a PLL as a frequency synthesizer?

Actuators

- What is the role of the protection diode (terminal diode, fly-back diode) in the relay actuator (inductive load)?
- List basic types of Solid state relays.
- List several types of electric motors and characterize how they are controlled.
- List the types of electric motors, describe their main characteristics, control methods, and applications.

Power factor

- What is Power Factor (PF)?
- What are the Basic Power Factor Correction (PFC) methods?
- Relationship between power factor and total current harmonic distortion.

AD/DA converters

22. What is the signal-to-quantization noise ratio?
23. What is the relationship between SNR and channel bandwidth?
24. Classify AD converter types (flash, pipeline, SAR, two/four slop, Delta-sigma) according to resolution and sampling frequency.
25. What are the basic principles (methods) of galvanic isolation in analog and digital systems?
26. List and explain the basic methods of DA conversion.

Sensors

27. Name 4 principles of temperature sensors.
28. What is the difference between sensitivity and selectivity of a sensor ?
29. What are two basic principles of gas sensors ?

EMC

Basic Aspects of EMC

1. What kind of regulations should be considered for compliance certification?
2. Noise vs. Interference
3. Describe approaches to EMC engineering – crisis approach vs. system approach.
4. How to understand graphics:
$$\text{CE} + \text{CE} = \text{CE}$$
5. What are the 3 main elements of EMC troubles? (Name elements necessary to produce an interference problem).

Spec EMS problems

6. Sketch an example of the impedance of a real decoupling capacitor as opposed to an perfect one.
7. How can the transimpedance be described (especially transimpedance of coaxial cable)?
- ~~8. Capacitive coupling. Effect of shield on capacitive coupling.~~
- ~~9. Magnetic coupling. Effect of nonmagnetic shield on magnetic coupling.~~
- ~~10. How to avoid magnetic coupling at low frequencies ?~~

Grounding

11. What is common impedance coupling ?
12. How to avoid ground impedance coupling ?
13. How could you describe difference between “grounding” and “earthing” ?

Shielding. (Strainer experiment)

14. What are components of total shield effectiveness ?
15. Shielded enclosure integrity
16. Elimination of noise coupled into a shielded enclosure by the wires that pass through the shield

Electrostatic Discharge

17. Static electricity generation mechanism

18. The human body model for ESD
19. Methods of transient voltage suppression

~~Sources of Noise, Coupling Mechanisms~~

- ~~20. Typical noise path~~
- ~~21. Noise sources~~
- ~~22. Name elements necessary to produce an interference problem.~~
- ~~23. What are three ways to break the noise path?~~
- ~~24. What are the three most important noise characteristics?~~

~~Digital Circuits Radiation~~

- ~~25. Differential-Mode radiation and Common-Mode radiation~~
- ~~26. Methods of controlling the differential-mode (loop) radiation~~
- ~~27. Methods of controlling the common-mode (dipole) radiation~~