

College of Engineering, Pune
(An Autonomous Institute of Government of Maharashtra)
End Semester Examination
Instrument Design Engineering

Academic Year: 2013- 14
Duration: 3 hours

Classes: F. Y. M. Tech
Max. Marks: 60

1. All questions are compulsory.
2. Draw neat figures wherever required.
3. Assume suitable data if required.

Q. 1

- a. Define reliability of electronic system? How we will calculate reliability of the different electronic components when they are connected in series or parallel? What are the different techniques to improve reliability of system? 5
- b. Why signal grounding is important? What are the different techniques of grounding signals? While designing various electronics circuits which techniques are preferred for analog, digital circuits 5

Q. 2

- a. A receptor circuit consists of a 1-m long wire, located 5 cm above a ground plane. Each end of the circuit is terminated with a 50-Ω resistor. An electric field induces a noise current of 0.5 mA into the circuit. The magnetic field from the same noise source induces a noise voltage of 25 mV into the circuit. 5
- a. If the noise voltage is measured across each of the terminating resistors, what will the two readings be?
 - b. What general conclusion can you draw from the above results?
 - c. What will happen if the polarity of the magnetic-field induced voltage is reversed?
- b. What do you mean by electrostatic discharge? Explain different steps involved in ESD? How to avoid ESD? 5

Q. 3

- a. The amplifier circuit has to design for temperature measurement system. Differential amplifier and an instrumentation amplifier are both designed to have a differential-mode gain of 50; both amplifiers using resistors having the same tolerance. Which amplifier will have the larger CMRR, and by how many dB? Which amplifier you will use and why? 5
- b. What do you mean by shielding effectiveness? Which are the different components it has? How it is affected by multiple reflections? 5

Q. 4

- a. Noise can be reduced in an electronic system using many techniques; a single unique solution to most noise reduction problem does not exist. Justify? Discuss different techniques for reduction of noise? 5
- b. For the differential amplifier shown in fig. 1 R_1 and R_2 are 1% resistor with values of $4\text{ K}\Omega$ and $230\text{ K}\Omega$ respectively 5
- What is the differential mode input impedance?
 - What is differential mode gain?
 - What is common mode input impedance?
 - What is common mode gain?
 - What is CMRR?

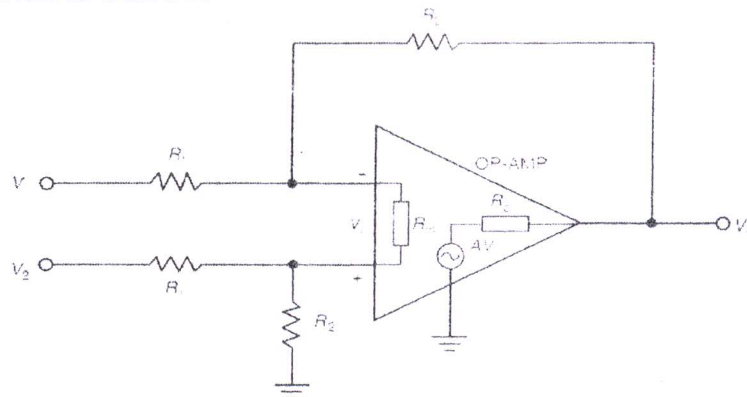


Fig.1

Q. 5

- a. State the importance of ground loops? How it affect the circuits? What are the different techniques of avoiding ground loops explain them briefly 5
- b. What are the different factors on which the characteristic of field is depending explain them briefly? When electric field will be dominated in electromagnetic field and why? 5

Q. 6

- a. A mechanical switch, having silver contacts, is used to control a 24-V dc relay with a winding resistance of $240\ \Omega$ and inductance of 10 mH . If the switch contacts are protected by an R-C network, what value resistor and capacitor should be used? 5
- b. Draw contact breakdown characteristics? Explain briefly different discharge that will happen during contact switching? How to avoid these discharges? 5