

Computer Science and Telecommunication Engineering

CSTE 01210: Digital Electronics and Pulse Technique

Non-Linear Application of Op-Amp 10

1. By using Op-amp draw and explain a schmitt trigger circuit that has zero volt centered hysteresis.
2. By using Op-amp draw and explain a schmitt trigger circuit that has +5V centered hysteresis.
3. By using Op-amp draw and explain a schmitt trigger circuit to produce rectangular wave from sine wave.
4. By using Op-amp draw and explain a schmitt trigger circuit to produce triangular wave from rectangular wave.
5. By using Op-amp draw and explain a waveform converter circuit to produce pulses from triangular wave.
6. By using Op-amp draw and explain a relaxation oscillator.
7. Prove that $T = 2RC \ln \frac{1+B}{1-B}$ is the period of the output rectangular wave of an op-amp relaxation oscillator. Where B= feedback fraction.
8. An op-amp relaxation oscillator has feedback fraction B=0.9, feedback resistor R=4.7 ohms and charging-discharging capacitor C=0.022 μ F. What is the frequency of the output rectangular wave?
9. Draw and explain a practical op-amp integrator. Explain the necessity of large resistor across the capacitor.
10. Draw and explain a practical op-amp differentiator. Explain the necessity of a small resistor in series with the capacitor.

Multivibrator 11

11. Draw and explain the following multivibrators by using 555 IC. Astable, Monostable
12. Make a Voltage Controlled Oscillator (VCO) by using 555 IC.
13. Draw the internal diagram of 555 IC when it is used as an astable multivibrator and explain it.
14. Derive the equation for calculating output frequency of the Astable multivibrator.
15. Show how to use a 555 timer and a bipolar current source to produce a ramp output.
16. What is duty cycle. Show how to calculate duty cycle for a 555 astable timer circuit.
17. For a 555 astable timer circuit it is impossible to make the duty cycle 50%. Why?
18. By using two npn transistors make a bistable multivibrator. Explain it.
19. By using two npn transistors draw an astable multivibrator. Explain it.
20. Draw the charging and discharging waveforms for anyone of the capacitors used in the astable multivibrator.
21. By using two npn transistors draw a monostable multivibrator. Explain it.

Thyristors 12

22. Explain the characteristics of thyristors. e.g. SCR, DIAC, TRIAC, UJT.
23. Write down some applications of thyristors.
24. Show how to use UJT to produce saw tooth waveform.
25. Draw and explain a relaxation oscillator circuit by using UJT

ADC and DAC 13

Computer Science and Telecommunication Engineering

26. Define: Quantization error, Step size, resolution of ADC and DAC, percentage of resolution.
27. A five-bit DAC has a current output. For a digital input of 10100, an output current of 10 mA is produced. What will I_{out} be for a digital input of 11101?
28. What are the merits and demerits of flash ADC?
29. What are the advantages of Successive Approximation ADC?
30. Draw the block diagram of ADC and DAC used to interface a computer to the analog world so that the computer can monitor and control physical variable.
31. Write down some applications of ADC and DAC.
32. Or. Why are ADC and DAC used?
33. Draw the diagram of the following circuits and explain their working principle. R/2R ladder, Digital ramp ADC (Counter type ADC), Successive approximation ADC, Flash ADC (Very fast ADC, simultaneous conversion type ADC).
34. Compare Flash ADC to SAC ADC.
35. Compare Digital ramp ADC to SAC ADC.
36. Draw and explain a DAC using op-amp summing amplifier with weighted resistor.
37. Voltage to frequency conversion ADC?
38. Draw and explain a sample and hold circuit.

Logic Families 8

39. Explain the operation of a CMOS inverter.
40. Explain the internal diagram of a TTL NAND gate.
41. What is meant by 'Fan out' of TTL device?
42. Explain, with necessary diagram, the principle of operation of an N-MOS inverter and an N-MOS NOR gate.
43. Explain a MOSFET switch.
44. Write the various characteristics of MOS logic gates regarding speed, power utilization and packing density.
45. Compare TTL and MOS devices.
46. Write down some ECL characteristics.



Memory Systems 9

47. What are the differences between the following terms 1). RAM and SAM, 2). DRAM and SRAM 3). ROM and RAM 4). EPROM and EEPROM.
48. What is the major drawback of MROM, PROM and EPROM? How is an EPROM erased?
49. What is the function of memory enable input?
50. What is the drawback of DRAM and SRAM?
51. Draw and explain the internal structure of 16×8 ROM.
52. Draw and explain the internal structure of 64×4 RAM.
53. How many address input, data input and output are required for $16K \times 8$ memory?
54. What is the benefit of address multiplexing?
55. Describe the way of realizing 16×8 RAM module by using two 16×4 RAM modules

Computer Science and Telecommunication Engineering

- 56. Realize a 32×4 RAM module by using two 16×4 RAM modules
- 57. What is the main application of ROM?

Clipper and Clamper circuits

-  58. Show the effect of RC time constant in a clamper circuit.
-  59. Why should the RC time constant be large in a clamper circuit?
- 60. Draw and explain a clipper circuit to clip the positive half cycle of a sinusoidal signal.
- 61. Draw and explain a clipper circuit to clip the negative half cycle of a sinusoidal signal.