Bhagwan Mahavir College of Engineering & Technology
Academic Year: 2016-2017
4th sem EC & Electronics
Subject: Analog Circuit Design (2141002)

Assignment -1 Submission date: 23-01-2017

1. Draw and explain RC coupled CE amplifier.
2. Draw and explain CC amplifier.
3. Explain transistor as a two port system.
4. State the behavior of transistor at high frequency.
5. List the parameters those effecting to the transistor at high frequencies.
6. Define and obtain expression for a transconductance for pnp transistor in CE configuration.
7. Define and obtain expression for input conductance.
8. Define and obtain expression for feedback conductance.
9. Define and obtain expression for spreading resistance.
10. Define and obtain expression for output conductance.
11. Draw and explain hybrid model for transistor on CE configuration.
12. Write a short note on validity of hybrid π model.
13. Derive CE current gain for finite value resistive load using π model.
14. Prove that 3-dB bandwidth of CE configuration is inversely proportional to the value of resistive load.
15. Derive the equation for the unity gain frequency and its relationship with cutoff frequency for CE hybrid π model.
16. Derive the expression of current gain with resistive load using CE hybrid π model.
17. Draw and explain single stage CE transistor amplifier response.
18. Explain significance of gain bandwidth product.
19. Using miller's theorem what is midband input capacitance of CE stage with a resistive load? What is high 3-dB frequency for current gain, if we

assume output time constant is small compared with the input time constant?

20. List the steps required to carry out analysis of feedback amplifier.

Assignment -2 Submission date: 13-02-2017

1. What is oscillator? Explain concept with Barkhausen criteria.
2. Classify oscillator in brief.
3. Explain RC-phase shift oscillator with neat circuit diagram.
4. Derive the expression of frequency of oscillation and minimum gain requires for sustain oscillation of RC phase shift oscillator.
5. Draw FET based RC coupled oscillator along with its small signal equivalent circuit.
6. Design RC phase shift oscillator to produce a sinusoidal output at 3 kHz.
7. Explain Wien Bridge Oscillator with neat sketch.
8. Derive the expression of frequency of oscillation of Wien Bridge Oscillator.
9. Draw the circuit and explain the operation of transistorized Wien Bridge Oscillator.
10. Draw and explain LC Oscillator in brief.
11. Draw and explain Hartley Oscillator.
12. Derive the expression of frequency of oscillation of Hartley Oscillator.
13. Explain working principle of Colpitt's Oscillator.
14. Derive the expression of frequency of oscillation of Colpitt's Oscillator.
15. Describe the principle of crystal oscillator along with its equivalent circuit.

Assignment -3 Submission date: 28-02-2017

1. What do you mean by differential amplifier?
2. List the characteristic of ideal op-amp.

3. Explain following terms:
    a. Differential input signal
    b. Differential gain
    c. Common mode gain
    d. CMMR
    e. Features of differential amplifier
    f. Input bias current
4. Describe the operation of Emitter Coupled Differential Amplifier.
5. Show the circuit and explain how to measure input bias current and CMMR of an op-amp.
6. List and explain the methods to improve CMMR.
7. Explain transfer characteristic of op-amp.
8. Analyze the dual input balanced output differential amplifier to obtain the following:
    a. Differential gain
    b. Common mode gain
    c. Output resistance
    d. Input resistance

Assignment -4 **Submission date: 20-03-2017**

1. Draw and explain block diagram of op-amp.
2. Enlist major difference between SSI, MSI, LSI and VLSI.
3. List and explain three types of linear IC packages.
4. Explain in brief the information is contained in a typical op-amp datasheet.
5. Explain following terms:
    a. Input offset voltage
    b. Output offset voltage
    c. Input bias current
    d. Input capacitance
    e. Output capacitance
    f. Input offset current

g. PSRR
h. Slew rate
i. Output voltage swing
j. Output short circuit current
k. Three open loop configuration of op-amp
l. Why open loop op-amp configuration is not used in linear application?

6. Draw equivalent circuit of op-amp and explain.
7. Explain in brief differential amplifier in open loop mode.
8. Explain in brief inverting amplifier in open loop mode.
9. Explain in brief non-inverting amplifier in open loop mode.

Assignment -5 Submission date: 10-04-2017

1. Explain negative feedback amplifier in brief.
2. List advantages of negative feedback amplifier.
3. Derive the expression of voltage gain, input resistance, output resistance and bandwidth for feedback inverting op-amp.
4. Derive the expression of voltage gain, input resistance, output resistance and bandwidth for on-inverting feedback op-amp.
5. Explain voltage follower in brief.
6. Explain voltage series feedback amplifier in brief.
7. Explain voltage shunt feedback amplifier in brief.
8. Draw and explain difference amplifier circuit using single op-amp and derive the expression for output voltage as a function of input voltages.
9. Draw and explain difference amplifier circuit using two op-amps and derive the expression for output voltage as a function of input voltages.
10. Define following electrical parameters of op-amp:
    a. Input offset voltage
    b. Output offset voltage
    c. Input bias current
    d. CMRR

11. Discuss design steps for input offset voltage compensating network.
12. What is thermal drift? How does it affect the performance of op-amp circuit?
13. What is error voltage? How can it be reduced?

Assignment -6 Submission date: 24-04-2017

1. Explain with necessary diagrams the working principle of AC amplifiers with single supply voltage.
2. Explain the application of op-amp as a peaking amplifier.
3. Explain application of op-amp as a subtractor and summing amplifier using differential configuration.
4. Explain application of op-amp as a summing, scaling and averaging amplifier using inverting configuration.
5. Explain application of op-amp as a summing, scaling and averaging amplifier using non-inverting configuration.
6. What is instrumentation amplifier? Explain operation of instrumentation amplifier.
7. Explain requirement of instrumentation amplifier along with its advantages and also explain one of its application.
8. Explain in brief differential instrumentation amplifier using Transducer Bridge.
9. Explain in brief temperature indicator using instrumentation amplifier.
10. Explain working of voltage to current convertor with floating load.
11. Explain low voltage DC voltmeter in brief.
12. Explain low voltage AC voltmeter in brief.

13. Explain diode match finder in brief.
14. Explain working of voltage to current convertor with grounded load.
15. Explain working of current to voltage convertor.
16. Explain working of high sensitivity current to voltage convertor.
17. Explain in brief DC coupled voltage follower.
18. Explain in brief AC coupled voltage follower.
19. Explain in brief with necessary diagram and waveforms of op-amp as an integrator.
20. Draw the circuit of basic integrator using op-amp. What are the problems associated with configuration? How they are overcome?
21. Explain practical integrator in brief.
22. Obtain frequency response of an ideal and practical integrator.
23. Write down design steps for an integrator.
24. Explain in brief with necessary diagram and waveforms of op-amp as a differentiator.
25. Explain practical differentiator in brief.
26. Obtain frequency response of an ideal and practical differentiator.
27. Write down design steps for a differentiator.
28. Compare active integrator and differentiator.

Assignment -7 **Submission date: 08-05-2017**

1. Write a short note on comparator circuit using op-amp.

2. Explain with necessary waveform an op-amp based inverting comparator circuit with positive and negative reference voltage.
3. Write a short note on ZCD.
4. Write a short note on Schmitt trigger (Regenerative comparator).
5. Draw noninverting Schmitt trigger comparator circuit and explain the threshold levels and hysteresis.
6. Write a short note on voltage limiters.
7. Explain application of an op-amp as a positive and negative clipper circuit.
8. Explain application of an op-amp as a clamper circuit.
9. Explain application of an op-amp as a peak detector
10. Explain with necessary diagram and waveform of absolute value circuit.
11. Write a short note on sample and hold circuit.
12. Write a short note on precision Rectifier.
13. Draw and explain square wave generator using op-amp.
14. Draw and explain triangular wave generator.
15. Draw and explain sawtooth generator using comparator and integrator.
16. Draw and explain the block diagram of 555 timer.
17. Explain working of 555 timer based monostable multivibrator.
18. Explain working of 555 timer based astable multivibrator.
19. Draw circuit diagram of an astable multivibrator using IC 555 and explain its operation. Derive expression for frequency of operation and duty cycle.
20. Write down an application of astable multivibrator.
21. Write a short note on free running ramp generator.
22. Write a short note on PLL.

23. List down application of PLL.
24. Discuss application of PLL as a frequency multiplication.