Unit Wise Important Questions

Subject : Linear IC Applications **III Year - Semester – I** **A.Y. : 2017-18**

UNIT 1

1. A) Draw the ac equivalent circuit of dual input balanced output differential amplifier and derive the expressions for small signal voltage gain, input resistance and output resistance.
   B) Compare the above results with a dual input unbalanced differential amplifier.
2. Draw the ac equivalent circuit of dual input unbalanced output differential amplifier and derive the expressions for small signal voltage gain, input resistance and output resistance.

3. A) What is an op-amp? Draw the equivalent circuit of a typical op-amp and explain.
   B) Draw the ac equivalent circuit of single input balanced output differential amplifier and derive the expressions for small signal voltage gain.
4. Explain the operation of Level translator with relevant diagrams and expressions.
5. Draw the small signal equivalent circuit of differential amplifier circuit and obtain the expressions for common mode gain and differential mode gain.
6. Derive the Differential Amplifier- AC analysis of single input dual output configuration in detail.
7. Perform AC and DC analysis of an emitter coupled pair.
8. Draw the circuit of any one type of differential amplifier and explain the operation
9. Derive the Differential Amplifier- AC analysis of Dual input single output Configuration in detail.
10. Explain the Properties of All types differential amplifier configuration in detail.

11. Explain the concept of Cascade Differential Amplifier Stages in detail.

12. Compare all differential amplifiers.

UNIT 2

1. List out the ideal characteristics of an operational amplifier.
2. A) Define slew rate of an Op-amp and explain its significance in the dynamic characteristics of an Op-amp.
   B) An op-amp has a slew rate of 2V/μs. What is the maximum frequency of an output sinusoid of peak value 5V at which the distortion sets in due to the slew rate limitation
3. Explain the basic internal block diagram of a typical operational amplifier.
4. Explain the measurement procedure for input and output offset voltages of a practical Op-amp.

5. A) With suitable sketches, explain the measurement procedure for the slew rate and CMRR.

   B) What is input bias current and explain the bias current compensation in an inverting and non-inverting amplifier circuits?
6. A) An OP-AMP has a differential gain equal to 90 dB and CMRR is 100 dB. If the two input voltages are 3μV, and 2 μV respectively, calculate the differential mode output and common mode output voltages.

7. What is thermal drift and mention the techniques to minimize the effect of thermal drift?
8. A) Explain the terms (i) slew rates (ii) CMRR (iii) PSRR (iv) drift and list out ideal and practical characteristics of above parameters.
   B) Explain the operation of Op-amp along with block diagram in detail.
9. Explain the Frequency Compensation techniques of op-amp in detail.
10. Draw the IC 741 op-amp pin diagram and explain the function of each pin in detail.
11. List out the applications and Temperature ranges of IC 741 Op-amp
12. Draw and explain the three open loop op-amp configurations with neat circuit diagram.

UNIT 3

1. A)Design a practical op-amp differentiator circuit for the frequency of 1KHz and explain its frequency response.

   B) Design a Schmitt trigger circuit for UTP and LTP of +3V and -3V respectively. explain its hysteresis curve.
2. A) Explain the operation of a grounded load V to I converter using op-amp.
   B) Design any stable multi vibrator circuit using 741 op-amp for the frequency of 10KHz square wave. Assume necessary data.

3. A) Design an Opamp based circuit to produce an output $-(V_1+2V_2-5V_3)$, where V_1, V_2 and V_3 are the input voltages.

   B) What is the difference between conventional rectifier and precision rectifier?

4. A) Design a Schmitt trigger circuit to convert 5V, 1 KHz sinusoidal signal to square wave using 741C. Draw its transfer characteristics, Input and output waveforms.

   B) Draw the circuit diagram of a practical log amplifier and obtain an expression for its output voltage.
5. A) Draw the circuit diagram of differentiator by using IC 741 and explain its operation.
   B) Explain the summer and difference amplifier using IC 741 and explain its operation.
6. What are the two closed loop configurations of an Op-Amp, obtain the gains in both the cases.

7. Draw the frequency response curve of a differentiator. How is it modified when a small resistor is connected in series with the capacitor?

8. Draw the circuit diagram of differentiator by using IC 741 and explain its operation.
9. Explain the summer and difference amplifier using IC 741 and explain its operation.
10. A) Draw the block diagram of log Amplifiers and explain its operation in detail.
    B) What are the limitations of log amplifier and how to overcome those limitations explain in detail.
11. Explain the operation of Square wave generators along with circuit diagram.
    b) Draw the block diagram of Non- Linear function generation and explain its operation.
12. A) Draw the Instrumentation amplifier and explain its operation in detail. [8M]
    B) Draw the Anti log Amplifiers circuit diagram and derive its output voltage in detail.

UNIT 4

1. A) Design a first order band pass filter with lower cutoff frequency of 100Hz and a higher cutoff frequency of 1KHz. The pass band gain should be 4. Calculate the 'Q' of the filter.
   B) Compare butterworth and chebyshev filter responses.

2. A)Classify the filters based on range of frequencies, frequency response, type of components used and type of input signal.

   B) Design a first order low pass filter with cutoff frequency of 1KHz and pass band gain of 11. Also draw its frequency response.
3. A) Design a first order high pass filter with a cutoff frequency of 1KHz and pass band gain of 11. Also draw its frequency response.
4. List the differences between the frequency responses of first order filters and second order filters.
5. A) Explain the term frequency scaling with a suitable example.
   B) Design a wide band-pass filter with f_H=200Hz ,f_L=1KHz and a pass-band gain=4. Draw the frequency response and calculate Q factor for the filter.
6. Draw the block diagram of Sample & Hold amplifier and explain its operation in detail.

7. Explain the operation of second order band reject filter along with circuit diagram.
8. A) Design a first order wide band reject filter with a higher cutoff frequency of 100Hz and a lower cutoff frequency of 1kHz. Calculate the Q of the filter.

9. Draw the circuit diagram of Sample & Hold amplifier and explain its operation in detail.
10. Draw the circuit diagram of All pass filters and derive its output response.
11. A)Draw the block diagram of balanced modulator and explain its operation in detail.
    B) Draw the 2nd order band pass filter and explain its operation in detail

12. Draw the block diagram of Four Quadrant multiplier and explain its operation in detail.

UNIT 5

1. A) Explain the operation of Monostable multivibrator using 555 timer. Derive the expression for quasi stable state time period of a Monostable multivibrator using 555 timer.

   B) Draw the block diagram of PLL and explain importance of each block

2. A) Define lock-in range and capture range of a PLL
   B) Draw the internal diagram of a 555 timer IC and explain significance of each pin.
3. A) Design a symmetrical square wave generator with 1KHz frequency and 5V peak value using 555 timer IC. Assume necessary data.
4. Explain the application of PLL as a FSK demodulator.
5. Explain the operation of an astable multivibrator using 555 timer. Derive the expression for on and off state time periods.

6. With a clear block diagram explain frequency multiplier using PLL.
7. A) Explain the block diagram of PLL emphasizing the capture range and lock range.
   B) Design monostable multivibrator using 555 timer to produce a pulse width of 100 m sec.
8. A) Draw and Explain the principles and description of individual blocks of PLL in detail.
   B) Explain the terms frequency multiplication, frequency translation of PLL
9. Draw the astable applications of Schmitt Trigger and explain its operation in detail.

10. Draw the block diagram of Astable operations using IC 555 and derive its time constant.

11. Draw the circuit diagram of VCO 566 and explain its operation.
12. A) Draw the circuit diagram of Monostable multivibrator by using IC 555 timer and explain its operation.

    B) Draw the block diagram of PLL and explain the operation of individual blocks in detail.

UNIT 6

1. A) Describe the operation of successive approximation type analog to digital converter.
   B) Draw the circuit of weighted resistor DAC and derive expression for output-analog voltage.
2. A) With a clear block diagram explain the data conversion procedure for dual slope ADC.
3. List the advantages of dual slope ADC compared to other ADC models.
4. A) Explain in detail with a neat circuit diagram the operation of 3-bit parallel ADC.

B) List the advantages and disadvantages of flash type ADC.

5. A) Explain in detail with a neat circuit diagram the operation of anR-2R ladder, DAC digital to analog converter.
6. List the advantages of R-2R ladder DAC compared to weighted resistor DAC
7. A) Describe the operation of dual slope A/D converter with necessary diagrams. Give some of its advantages & disadvantages.

   B) How many resistors are required for an 8-bit weighted resistors D/A converter? What are those resistor values, assuming the smallest resistance is R?

8. Draw the block diagram of inverted R-2R DAC and explain its operation in detail.
9. List out the DAC and ADC Specifications and compare them in detail.
10. A)Draw the block diagram of dual slope ADC and explain its operation in detail.
    B) Draw the circuit diagram of weighted resistor DAC and explain its operation in detail.
11. A) Draw the block diagram of successive approximation ADC and explain its operation in detail.

    B) Draw the circuit diagram of counter type ADC and explain its operation in detail.

12. Draw the block diagram of parallel Comparator type ADC and explain the operation of it.