

**III B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019**  
**LINEAR IC APPLICATIONS**

(Common to Electronics and Communication Engineering, Electronics and Instrumentation Engineering, Electronics and Computer Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answer **ALL** the question in **Part-A**  
 3. Answer any **FOUR** Questions from **Part-B**
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**PART -A****(14 Marks)**

1. a) What is the use of level translator? [2M]
- b) List out the ideal characteristics of operational amplifier. [3M]
- c) Write the important features of Instrumentation Amplifier. [2M]
- d) Sketch the ideal frequency response graphs for low-pass, high-pass and band-pass filters. [3M]
- e) Draw the pin diagram of 555 Timer. [2M]
- f) Write short notes on Linearity of a converter. [2M]

**PART -B****(56 Marks)**

2. a) Draw the circuit diagram of basic differential amplifier and explain it. [7M]
- b) Derive the expression for voltage gain of dual input unbalanced output differential amplifier. [7M]
3. a) Explain about Input offset current and input offset voltage. [7M]
- b) What is the need for frequency compensation? Discuss about pole-zero compensation. [7M]
4. a) Sketch the voltage to current converter circuit and explain its operation. [7M]
- b) With neat diagrams, explain the operation of Inverting comparator. [7M]
5. a) Sketch the circuit of second order high pass active filter and explain its operation. [7M]
- b) Design a wide band pass filter having  $f_l = 600$  Hz,  $f_h = 2$  KHz and pass band gain = 4. [7M]
6. a) Sketch the block diagram of 555 Timer and explain each block in it. [7M]
- b) Explain about analog phase detector in a PLL system. [7M]
7. a) Discuss about IC 1408 D/A converter. [7M]
- b) Draw the basic circuit of parallel A/D converter and explain its operation. [7M]

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**PART -A****(14 Marks)**

1. a) What is meant by balanced output and unbalanced output in differential amplifier? [2M]
- b) What are the advantages of integrated circuit over discrete component circuit? [2M]
- c) Draw the circuit diagrams of Integrator and differentiator using op-amp. [2M]
- d) Define bandwidth, cutoff frequency and transfer function in a filter. [3M]
- e) Write the applications of VCO. [3M]
- f) Write short notes on monotonicity in DAC. [2M]

**PART -B****(56 Marks)**

2. a) List out the four differential amplifier circuit configurations and draw their circuit diagrams. [7M]
- b) Derive the expression for voltage gain of single input balanced output differential amplifier. [7M]
3. a) What is slew rate? How it effect the performance of op-amp? Explain in detail. [7M]
- b) Draw the block diagram of operational amplifier and explain about the function of each block. [7M]
4. a) Draw the circuit diagram of Precision full-wave rectifier and explain its operation. [7M]
- b) Explain the operation of Triangular wave generator using op-amp. [7M]
5. a) Explain how a band pass filter can be constructed by the use of a low-pass and a high-pass filter? [7M]
- b) Design a second order Butterworth high pass filter having lower cut-off frequency of 2 KHz. [7M]
6. a) Explain how a 555 Timer can be used as astable multivibrator? [7M]
- b) Explain the use of PLL as a frequency translator. [7M]
7. a) With the necessary circuit diagram, explain the operation of Inverted R-2R ladder DAC. [7M]
- b) Explain the operation of counter type A/D converter. [7M]

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**PART –A****(14 Marks)**

1. a) What is meant by differential gain? [2M]
- b) Give the temperatures ranges for op-amp. [2M]
- c) Write short notes on op-amp as a subtractor. [3M]
- d) Write the advantages of active filters over passive filters. [2M]
- e) List out the applications of 555 Timer in monostable mode. [3M]
- f) Define resolution of a converter. [2M]

**PART –B****(56 Marks)**

2. a) Derive the expressions for output current and output voltage from the D.C analysis of differential amplifier. [7M]
- b) Derive the expressions for input resistance and output resistance of a single input unbalanced output differential amplifier. [7M]
3. a) What are the various IC packages available? Explain. [7M]
- b) Explain in detail about CMRR and PSRR. [7M]
4. a) Draw the circuit diagram of Antilog amplifier and explain its operation. [7M]
- b) Derive the expression for frequency of Astable Multivibrator using op-amp. [7M]
5. a) What is an all pass filter? Explain in detail. [7M]
- b) Design fourth order Butterworth low pass filter with a cut-off frequency of 1 KHz. [7M]
6. a) With the help of circuit diagram, explain how 555 timer is used as Schmitt Trigger? [7M]
- b) Draw the diagram of frequency multiplier using PLL and explain it. [7M]
7. a) Discuss about the R-2R ladder DAC and write the advantage of it. [7M]
- b) Draw the functional diagram of the successive approximation ADC and explain its operation. [7M]

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**PART -A****(14 Marks)**

1. a) What is meant by D.C Coupling? [2M]
- b) What is the primary difference between linear ICs and Digital ICs? [2M]
- c) What are the advantages of precision diode? [2M]
- d) Define notch filter. [3M]
- e) Define lock-in range and capture range. [2M]
- f) The basic step of a 9-bit DAC is 10.3 mV. If 00000000 represents 0 V, what output is produced if the input is 101101111? [3M]

**PART -B****(56 Marks)**

2. a) Draw the circuit diagram of dual input balanced output differential amplifier and derive the expression for voltage gain. [7M]
- b) Discuss about cascade differential amplifier stages. [7M]
3. a) Discuss about power supplies used in op-amps. [7M]
- b) Explain about frequency compensation using Dominant-Pole approach. [7M]
4. a) Draw the circuit diagram of Non-inverting summing amplifier and explain its operation. [7M]
- b) Discuss about Zero crossing detector and window detector. [7M]
5. a) Draw the circuit diagram of general second order filter and derive the expression for transfer function of it. [7M]
- b) Design the first order high pass filter with pass band gain of 2 and lower cut-off frequency of 2 KHz. [7M]
6. a) Design a square wave generator of frequency 100 Hz and duty cycle of 75% using 555 Timer. [7M]
- b) Draw the block schematic of the PLL and explain the function of each block in it. [7M]
7. a) Draw the circuit diagram of simple Weighted Resistor DAC and explain its operation. [7M]
- b) Explain in detail about the dual slope ADC. [7M]

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