III B.Tech. I Semester Supplementary Examinations, December - 2013

LINEAR IC APPLICATIONS

(Electronics and Communications Engineering)

Time: 3 Hours Max Marks: 80

Answer any FIVE Questions All Questions carry equal marks

- 1. (a) Draw the circuit diagram of dual input unbalanced output differential amplifier and derive the expression for dc analysis.
 - (b) Design a constant current bas circuit using zener diode for the following specifications: I_{E3} =5mA, zener diode with V_z =4.7V, I_{zt} =5.3mA, transistor with β_{ac} = β_{dc} =100 and V_{BE} = 0.175V, V_{CC} = V_{EE} =9 Volts.
- 2. (a) Draw the pin diagram and schematic symbol of a typical OP-AMP IC741 and explain the function of each pin.
 - (b)For an OP-AMP, PSRR is 70dB, CMRR is 10^5 , and differential mode gain is 10^5 . The output voltage changes by 20V in 4 µsec. Calculate: (i) numerical value of PSRR (ii) Common mode gain and (iii) Slew rate.
- 3. (a) Draw and explain the ideal differentiator circuit using an Op-Amp. Mention its drawbacks and how these can be eliminated by using a practical differentiator.
 - (b) For the non-inverting a.c amplifier R_{in} =50 Ω , C_{i} =0.1 μ f, R_{I} =100 Ω , R_{F} =1 $k\Omega$ and R_{O} =10 $k\Omega$. Determine the gain & band width of the amplifier.
- 4. (a) Explain the principle of operation of a log amplifier with neat circuit diagram.
 - (b)Design a Schmitt trigger with an Op-Amp μ A741 with the following specifications and also determine the threshold voltages V_{UT} and V_{LT} .

 $R_1 = 100k\Omega$, $R_2 = 56k\Omega$, $V_{IN}(pp) = 1V$ and $V_{CC} = V_{EE} = 15V$

- 5. (a) Draw the circuit diagram of fourth order butter worth low pass filter using an Op-Amp. And also draw the frequency response of it.
 - (b) For the all pass filter, determine the phase shift between the input and output at f=2kHz. To obtain a positive phase shift, what modifications are necessary in the circuit?
- 6. (a)Design an astable multivibrator using 555 Timer to operate at 10 KHz with 40% duty cycle.
 - (b) With a suitable circuit diagram using NE 565 PLL IC, explain the implementation of a frequency translation.
- 7. (a) List and compare different types of analog to digital converters.
 - (b) Explain the operation of successive approximation type ADC with neat circuit diagram.
- 8. (a) Briefly explain the applications of analog multiplexers.
 - (b)Draw the circuit diagram of sample and hold circuit and explain its working.

Set No: 2

III B.Tech. I Semester Supplementary Examinations, December - 2013

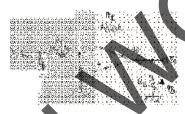
LINEAR IC APPLICATIONS

(Electronics and Communications Engineering)

Time: 3 Hours Max Marks: 80

> Answer any FIVE Questions All Questions carry equal marks

- 1. (a) What is a differential amplifier? Mention the classification of differential amplifier with neat diagrams.
 - (b) Draw the ac and dc equivalent circuits of single input balanced output differential amplifier and also derive an expression for voltage gain of this differential amplifier.
- 2. (a) What are the differences between the inverting and non inverting terminals? What do you mean by the term "virtual ground"?
 - (b) For the circuit shown below; calculate I_1 , I_L and V_0 with $R_1=10\text{k}\Omega$, $R_2=100\text{k}\Omega$, $V_1=1\text{V}$, $R_L = 25 \mathrm{K}\Omega$.



- 3. (a) With suitable circuit diagram explain about voltage to current converter with grounded load and also derive the expression for the output current.
 - (b) Design a differentiator circuit to differentiate an input signal that varies in frequency from 10Hz to about 1kHz. Draw its output waveform, if $Sin[2\pi(1000)t]$ signal is applied.
- 4. (a) With neat circuit diagram, explain the operation of monostable multivibrator using an Op-Amp. And also derive an expression for the time period.
 - (b) Design a triangular wave generator with the following specifications: f₀=2kHz, $V_0(pp)=7V$ and supply voltage is $\pm 15V$
- 5. (a) With neat circuit diagram explain the operation of 2nd order butter worth HPF and derive an expression for voltage gain.
 - (b) A certain narrow band pass filter has been designed to meet the following specification: $f_C = 2kHz$, Q = 20, and $A_F = 10$. What modifications are necessary in the filter design to change for to 1kHz keeping gain and bandwidth constant?
- (a) In the astable mode of 555 Timer, $R_A=2.2k\Omega$, $R_B=3.9k\Omega$ and C=0.1 μ f. Determine the positive pulse width t_C , negative pulse width and free running frequency t_0 . And also find the duty cycle.
 - (b) With a neat functional diagram, explain the operation of VCO and also derive an expression for free running frequency, f_0 .

- 7. (a) Which type of DAC is more preferable? Draw the circuit diagram and obtain expression for output voltage for 4 bits.
 - (b) What is an integrating type ADC? Explain the operation of dual slope ADC.
- 8. (a) Draw the circuit diagram of four quadrant multiplier and explain briefly.



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LINEAR IC APPLICATIONS

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- 1. (a) Design a level translator circuit using current mirror circuit for the following specifications:
 - (b) Explain briefly about constant current bias circuit using resistive network.
- 2. (a) Mention the types of open loop configurations of an Op-Amp. Explain each configuration in detail.
 - (b) Explain the following characteristics of an Op-Amp: (i) Slew Rate (ii) CMRR (iii) PSRR.
- 3. (a) What is a summer? Design a summer to add 4 input voltages in inverting configuration.
 - (b) What are the special cases of closed loop inverting amplifier and explain each one in detail.
- 4. (a) Draw the regenerative comparator circuit and derive an expression for threshold voltages $V_{\rm LT}$ and $V_{\rm HT}$.
 - (b) Describe the principle of operation of a precision half wave rectifier with waveforms.
- 5. (a) With suitable circuit diagram explain the operation of Narrow band pass filter (NBPF) and give the necessary design expression.
 - (b) Design a wide band reject filter using the first order HPF and LPF having f_L =2kHz and f_H =400Hz respectively and with a pass band gain of 2.
- 6. (a) Using a 555 Timer, design a monostable multivibrator having an output pulse width of 100msec.
 - (b) Briefly explain the block diagram of PLL and also derive the expression for lock range and capture range.
- 7. (a) Explain the following terms with respect to ADCs: (i) Conversion Time (ii) Resolution (iii) Linearity
 - (b) Give the schematic circuit diagram of the fastest A/D converter and explain its operation.
- 8. (a) Draw the circuit diagram of balanced modulator using IC1496 and explain in detail.
 - (b) Draw the circuit diagram of sample and hold circuit and explain its working.

Set No: 4

III B.Tech. I Semester Supplementary Examinations, December - 2013

LINEAR IC APPLICATIONS

(Electronics and Communications Engineering)

Time: 3 Hours Max Marks: 80

> Answer any FIVE Questions All Questions carry equal marks ****

- With suitable circuit diagram explain about Dual input balanced output differential amplif And derive necessary expressions for dc and ac analysis.
- and explain each (a) What is an Op-Amp? Draw the functional block diagram of an Op-Amp 2. block in detail.
 - (b) Mention the ideal and practical characteristics of an Op-Amp.
- 3. (a) Explain and derive an expression for the voltage gain of closed loop inverting amplifier with three Op-Amps.
 - to get the output expression as (b) Design an adder circuit using an Op-Amp $V_0 = -(0.1V_1 + V_2 + 10V_3)$.
- (a) What are the drawbacks in a Zero-Crossing Detector (ZCD)? How these drawbacks can be overcome by using a Schmitt trigger. Explain.
 - (b) Design a triangular wave generator using a comparator and an integrator, so that f_o =2kHz and $V_{o(p-p)}=7V$. The supply voltages are $\pm 15V$. Assume $\pm V_{sat}=\pm 14V$.
- (a) What is an all pass filter? Explain the principle of operation of this filter with neat circuit diagram.
 - (b) Design a high pass filter at a lower cutoff frequency of 600Hz and a pass band gain of 2.
- (a) With neat circuit diagrams, explain the astable mode of operation of 555 Timer.
 - (b) List the applications of PLL? Explain any two applications of PLL in detail.
- (a) Compare successive approximation ADC with parallel comparator type ADC.
 - (b) Draw the complete block schematic circuit including gating circuit, level amplifiers of R-**IR** 4 bit D/A converter and explain its operations. Derive expression for its output voltage
- a) Give the working principle of Analog-Multiplexer. Give block diagram of a 16 input analog multiplexer using CMOS gates and explain how it works
 - (b) Mention the applications of analog multiplexers and explain any two applications.