53 (EC 403) LINC

2017

LINEAR INTEGRATED CIRCUIT

Paper : EC 403

Full Marks : 100

Time : Three hours

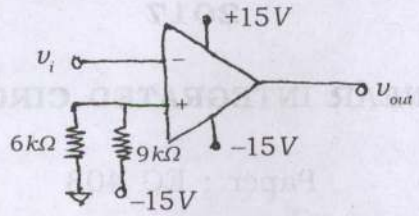
The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

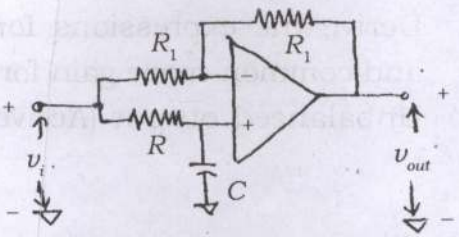
1. *(a)* Derive the expressions for differential and common-mode gain for Dual-input-Unbalanced output (Active load). 5+5

(b) Why compensation is necessary in multi-stage amplification ? Show the different compensation techniques; briefly explain Miller's compensation. 1+2+2

(c) Sketch the input-output waveforms for the following circuit while the input $v_i(t) = 10 \sin 2000\pi t$. 5



2. (a) Derive the transfer function $H(s) = \frac{v_{out}(s)}{v_i(s)}$ for the following circuit and calculate the magnitude of $H(s)$ and plot the frequency response of this transfer function. 5+1+2

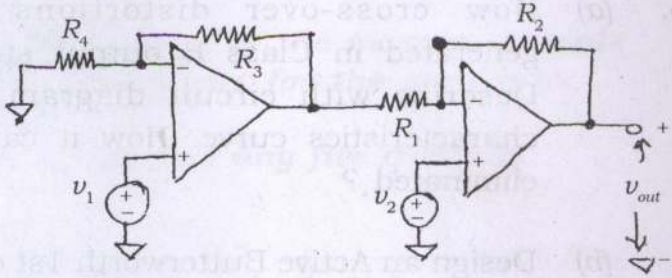


(b) Derive the expressions for differential and common-mode gain for single input balanced output differential Amplifier. 6+6

3. *(a)* Mention the different types of ADC and explain the operation of SAR ADC and Delta-Sigma ADC. 5+5

(b) Explain the use of op-Amp as Voltage Controlled Current Source (VCCS). 5

(c) Prove that the following circuit emulates a difference amplifier provided the ratio of R_3, R_4 is equal to the ratio of R_1, R_2. 5



4. *(a)* Describe the operation of precision rectifier with circuit and waveforms. 8

(b) Describe the internal circuitry and operation of 555 timer IC with proper diagram. 8

(c) Implement the logarithmic function on the input using op-Amp. 4

5. *(a)* Describe the operation of emitter follower as a Class-A output stage, describe the output voltage and current swing limits. 8

(b) Describe the operation of Astable multivibrator using 555 timer and hence derive the expressions of the time period for the $O/_P$ waveform. 10+2

6. *(a)* How cross-over distortions are generated in Class B output stages. Describe with circuit diagram and characteristics curve. How it can be eliminated ? 6+2

(b) Design an Active Butterworth 1st order low pass filter with DC gain of $60dB$ and cut off frequency of $2kHz$. 5

(c) Draw the circuit diagram of Inverting integrator and calculate the $-3dB$ frequency of the integrator. 5+2