53 (EC 403) LINC

2014

LINEAR INTEGRATED CIRCUIT

Paper : EC 403

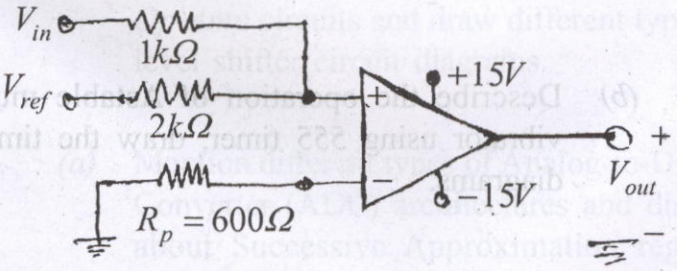
Full Marks : 100

Time : Three hours

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

*Answer **any Five** questions.*

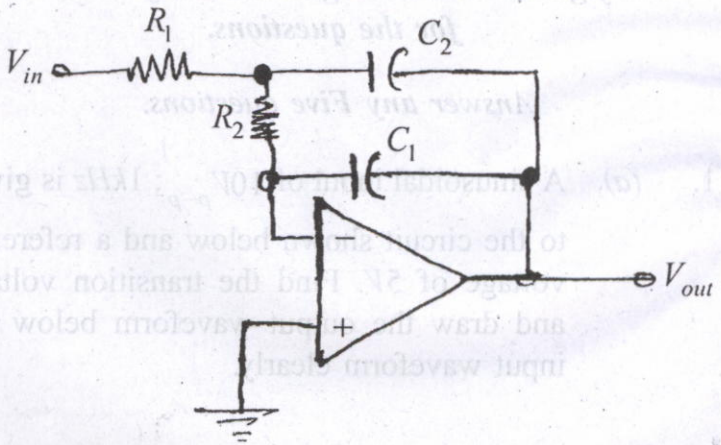
1. *(a)* A sinusoidal input of $10V_{p-p}$; $1kHz$ is given to the circuit shown below and a reference voltage of $5V$. Find the transition voltage and draw the output waveform below the input waveform clearly. 5



(b) Draw the circuit diagram for a dual-input balanced output differential amplifier.

Find its differential gain and common-mode gain and CMMR expressions. 15

2. (a) Find the transfer function of the following circuit and show which operation it can perform. 10



(b) Describe the operation of Astable multi-vibrator using 555 timer, draw the timing diagrams. 10

3. *(a)* Mention different types of compensation techniques to avoid instability and draw the circuit diagrams and discuss with help of frequency response curve. 10

(b) Draw a non-ideal model of *Op-Amp.* showing (1) Bandwidth of ω_p *radian/sec*

(2) Open loop gain $100\frac{V}{mV}$

(3) Input Resistance of $100k\Omega$

(4) Output Resistance of $1k\Omega$

(5) Bias currents $I_p = 10mA$

$\& I_N = 18mA$

(6) *DC* offset voltage of $100mV$. 5

(c) Describe the necessity of level shifters in *Op-Amp* circuits and draw different types of level shifter circuit diagrams. 5

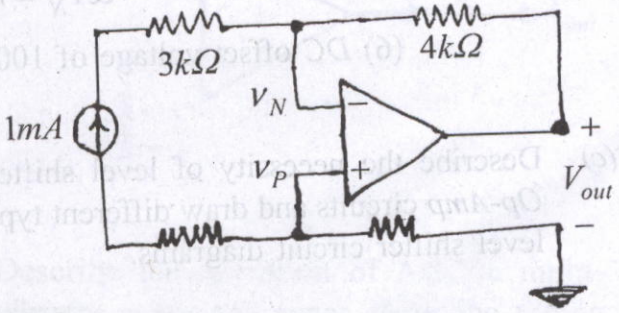
4. *(a)* Mention different types of Analog-to-Digital Converter (ADC) architectures and discuss about Successive Approximation register ADC. 10

(b) Draw the internal circuit diagram of a general purpose 741-*Op-Amp* showing different stages clearly. 5

(c) Draw the circuit diagram for testing/ measuring Input bias currents of an *Op-Amp* and explain in brief. 5

5. (a) Describe the effect of input bias currents on the output of an inverting amplifier. Find the expression for output voltage in presence of input bias currents. 5

(b) Find out the value of V_P, V_N and V_{out} for the following diagram. 10



(c) Define the following terms. 5

(i) PSRR *(ii)* V_{IO} *(iii)* SR.

6. *(a)* Describe the operation of Square-wave generator using *Op-Amp* and calculate the frequency of the Square wave. 10

(b) Design an Active beffer worth filter whose *DC* gain is $20dB$ and cut off frequency is $1kHz$ and input resistance of at least $10k\Omega$. 10