53 (EC 403) LICR

2016

LINEAR INTEGRATED CIRCUIT

Paper : EC 403

Full Marks : 100

Time : Three hours

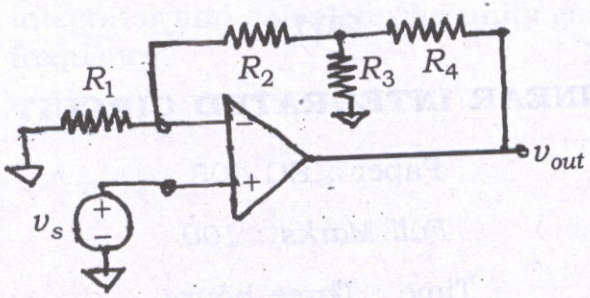
The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

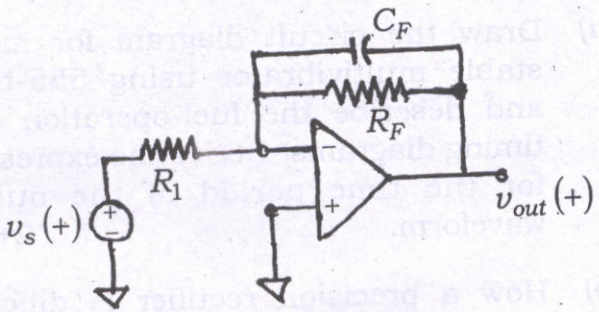
1. *(a)* Draw the circuit diagram for mono-stable multivibrator using 555-timer and describe the fuel-operation with timing diagrams. Derive the expression for the time period of the output waveform. 2+6+2

   (b) How a precision rectifier is different from a normal rectifier? Explain the fuel-operation of a precision rectifier with circuit diagram and o/p waveforms. 2+6+2

2. *(a)* Assuming an ideal op-amp, derive the expression for the output voltage for the following circuit 8



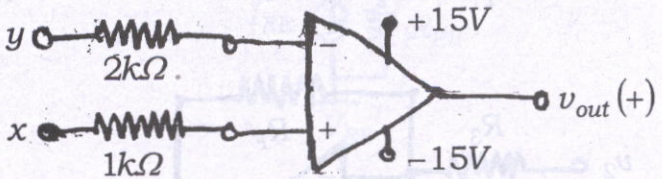
(b) Calculate the DC gain, $-3dB$ frequency and unity gain frequency of the following circuit. What is the high frequency gain of the circuit? 2+4+4+2



3. *(a)* Derive the expression for differential gain in a dual input unbalanced output (Active load). 12

(b) An Astable multivibrator can produce square waves. Justify with circuit diagram and full explanation of the operation for the same circuit. 8

4. (a) A sinusoidal input of $10V_{p\text{-}p}$, $1kHz$ is applied to the following circuit at 'x' node and a reference voltage of $+5V$ at 'y' node. Draw the output and input waveforms. 5



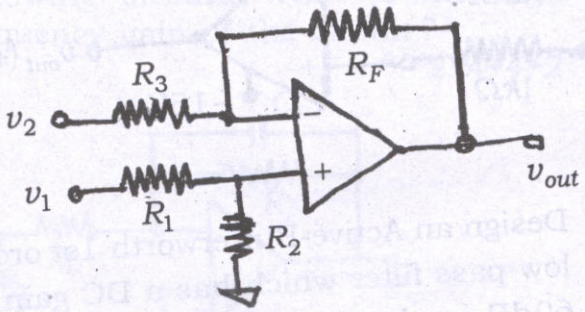
(b) Design an Active-Butterworth 1st order low-pass filter which has a DC gain of $60dB$ in the pass band and edge of stop-band frequency $10kHz$. 5

(c) How can you make a wide-band pass filter with the help of low pass and high pass filter ? Explain. 5

(d) Design a logarithmic amplifier using op-amp. 5

5. (a) Describe how an op-amp can be used for current amplification with proper circuit diagram. 5

(b) Derive the expression for the output voltage in the circuit shown below and mention the input resistance expression for v_1 and v_2 nodes. 4+2



(c) Calculate the expression for common-mode gain for the above circuit shown and mention what will be output resistance of the same circuit. 7+2

3.

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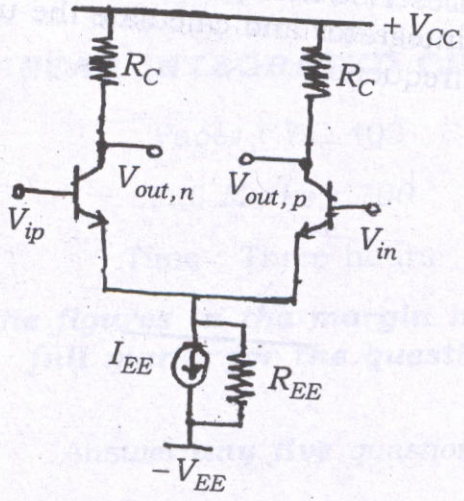
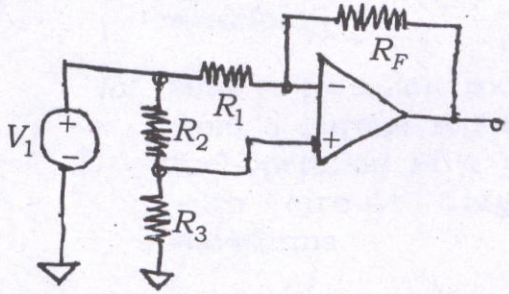
6. *(a)* Derive the expression for differential gain and common-mode gain for the following circuit. 5+5



(b) Derive the expression for output voltage for the following circuit (Assuming ideal op-amp). 10



7. *(a)* Describe the operation of PLL with the help of block diagram. 10

(b) Describe the operation of non-inverting integrator and calculate the unity gain frequency. 10
