B.E. Instrumentation Engineering Fourth Semester

IN404 - Linear Integrated Circuits

P. Pages : 3 **GUG/W/18/1577**

Time : Three Hours * 1 2 4 1 * Max. Marks : 80

Notes :
1. Same answer book must be used for all question.
2. All questions carry marks as indicated.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.

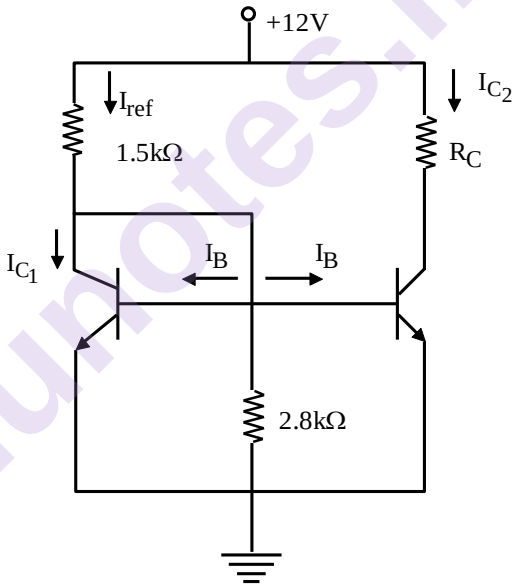
1. a) Why CMRR $\rightarrow \infty$ for an emitter coupled differential amplifier when $R_E \rightarrow \infty$. **8**

b) For the circuit shown in figure - **8**

i) Determine I_{C_1} & I_{C_2}

ii) Determine RC

so that $V_o = 6V$, assume $\beta = 200$



OR

2. a) Define following terms and indicate their ideal values & typical values for IC 741. **8**

i) Input bias current
ii) Input offset current
iii) Input offset voltage
iv) CMRR
v) PSRR
vi) Slew rate
vii) Open loop voltage gain
viii) Output Impedance

b) Design a widlar current source for generating a constant current **8**
$i_o = 10\mu A$, Assume $V_{CC} = 10V$, $V_{DE} = 0.7V$, $\beta = 125$ and $V_T = 25mV$.

3. a) Draw the circuit of instrumentation amplifier with three op-amp and derive the expression for output voltage. **8**

b) Design the practical differentiator circuit to differentiate a sinewave signal of sin(628.31t) Draw the output waveform. **8**

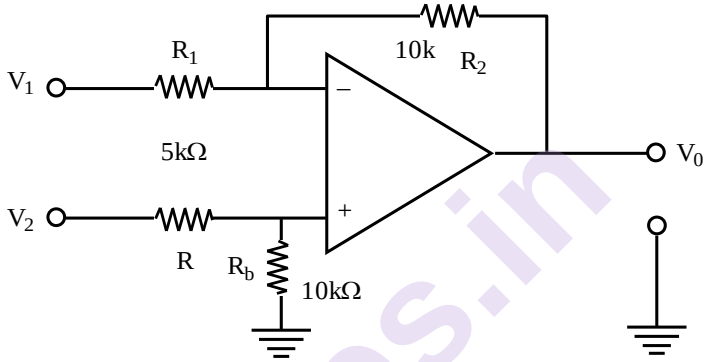
OR

4. a) **8**

In the op-amp circuit shown in fig. it is desired that $V_0 = \frac{V_2}{3} - 2V_1$

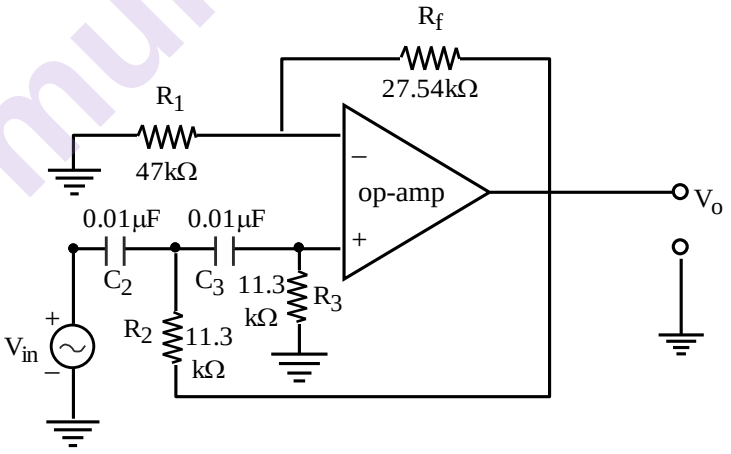
i) find the value of R to achieve V_0

ii) Suppose $V_1 = -10V$ & $V_2 = 10V$, find the magnitude of the current through all the resistors & power dissipated by the resistors.



b) Justify the necessity of feedback for op-amp with voltage transfer curve. **8**

5. a) For the circuit shown in the figure, determine the lower cut-off frequency and then plot the frequency response of the filter. Comment on the order of the filter from the frequency response. **8**



b) Describe various types of filters with their frequency response. **8**

OR

6. a) Derive the expression for frequency of oscillation and the condition of gain for sustain oscillation of phase shift oscillator with neat sketch. **8**

b) Design a square wave oscillator for f = 1kHz. The op-amp is 741 with supply voltages ± 15V. **8**

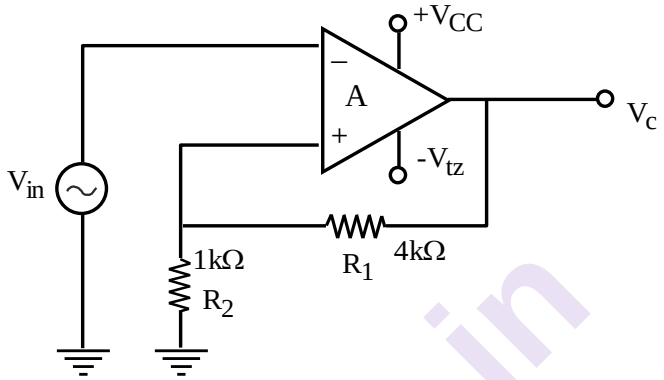
7. a) Illustrate the working of sample and hold circuit with its input and output waveforms. **8**

b) i) Design a Schmitt trigger whose V_{ut} & V_{et} are $\pm 5V$. Draw its waveforms. **8**

ii) Compare Schmitt trigger and comparator.

OR

8. a) The op-amp comparator circuit is shown in fig. Assume $V_{CC} = \pm 12V$, $V_{sat} = 0.9\,V_{CC}$ if the sine wave of 10V is applied, calculate threshold levels and plot input output waveforms. **8**



b) Draw the circuit diagram of positive and negative clampers also discuss the working with its input & output waveforms. **8**

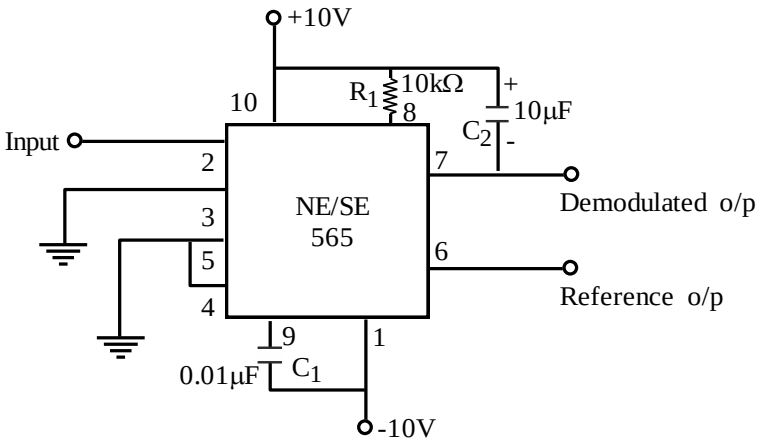
9. a) Design an a stable Multivibrator using 555 timer to generate a clock of 1 kHz with 60% duty cycle. Modify the circuit to obtain a clock of 1 kHz with 40% duty cycle. **8**

b) Illustrate any one application of monostable Multivibrator using 555 timer IC. **8**

OR

10. a) Compare linear regulator and switching regulators. **8**

b) For the circuit shown in figure, calculate free running frequency, lock range and capture range. **8**



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