EE2002 2014/2015

TUTORIAL 3 (with answers at the back)

l.a) The op-amp in Fig. T 3.1 has a unity-gain frequency of l.2MHz.
   i) What is the closed loop BW?
   ii) What is the closed-loop gain at 600kHz ?

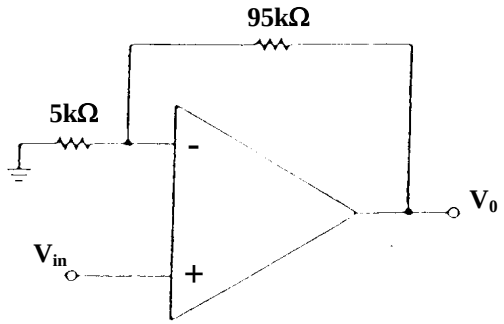

Fig. T3-1

1.b)The op-amp shown in Fig. T3-2 has a SR of 4 V/μS and a unity-gain frequency of 2MHz. Determine whether the amplifier will distort the input signal shown.

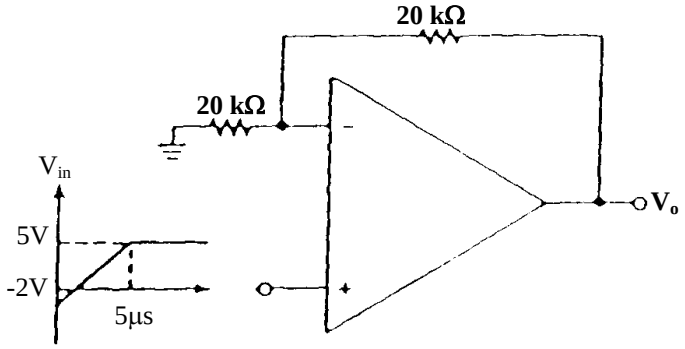

Fig. T3-2

2. The op-amp in Fig T3-3 has a slew rate of 0.50V/μS. The amplifier must be capable of amplifying the following input signals:

   $v_1 = 0.01\sin(10^6 t)$
   $v_2 = 0.05\sin(350 \times 10^3 t)$
   $v_3 = 0.10\sin(200 \times 10^3 t)$
   $v_4 = 0.20\sin(50 \times 10^3 t)$

   a) Determine whether the output will be distorted due to slew-rate limitations on any input.
   b) If so, find a remedy (other than changing the input signals).

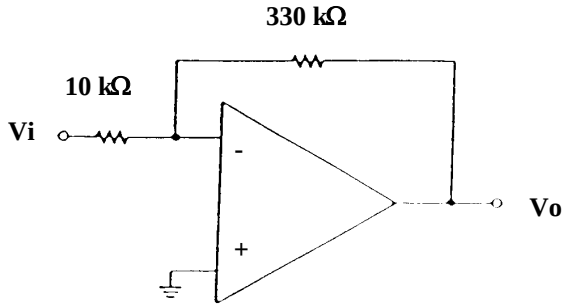

Fig. T3-3

3.a) What minimum SR is necessary for a unity-gain amplifier that must pass, without distortion, the input waveform shown in Fig T3-4.

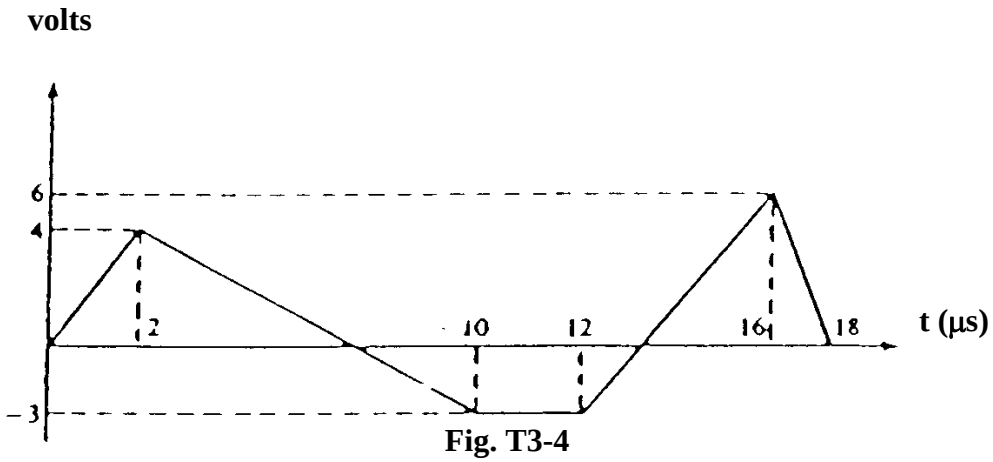

Fig. T3-4

3.b)Repeat (a), if the amplifier is in a noninverting configuration with R_l=50kΩ and R_f=100kΩ.

4. In a certain application, a signal source having 60kΩ of source resistance produces a 1-V-rms signal. The signal must be amplified to 2.5V rms and drive a 1kΩ load. Assuming that the phase of the load voltage is of no concern, design an op-amp circuit for the application.

Answers to Tutorial 3

1. (a)
   (i) $BW_{CL} = 60$ kHz

   (ii) $\frac{\mathbf{v_o}}{\mathbf{v_{in}}}\mathbf{(600kHz)} = \mathbf{2.0}\,{}^{\mathbf{V}}\!/_{\mathbf{V}}$

   (b) No distortion will occur

2. (a) The output due to v_2 and v_3 will be distorted.
   (b) There are only two remedies:
      (i) find an amp with greater SR, a SR of at least 0.66 V/μs
      (ii) reduce the A_{CL} of the present amplifier to 25 V/V.

3. (a) The minimum SR is 3.0 V/μs
   (b) The $(SR)_{min} = 9$ V/μs

4. Many right answers.