

# B. Tech Third Year : 5<sup>th</sup> Semester

# LINEAR INTEGRATED CIRCUITS, DEC., 2012

(FOR 5 EC 2 BRANCH OF ENGINEERING)

Times : 3 Hours

Min. Passing Marks : 24

Total Marks : 80

Instructions to Candidates : Attempt overall five questions selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitable be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

### UNIT-I

1. Derive expressions for closed loop voltage gain, Input resistance with feedback, Output resistance with feedback for a voltage - series feedback amplifier using an Operational amplifier. [16]

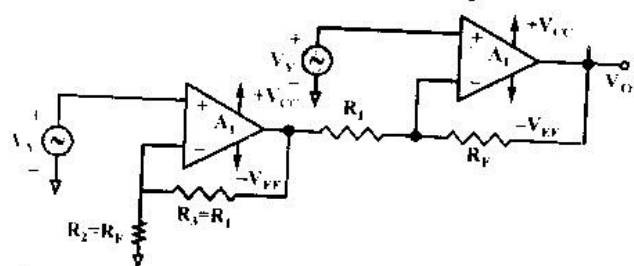
OR

1. The following specification apply to the differential amplifier shown below: [16]

$R_2 = R_f = 2.2k\Omega$ ,  $R_3 = R_1 = 1k\Omega$ ,  $v_x = 700mv$  pp, and  $v_y = 500mv$  pp sine waves at 500Hz;

The op-amp is a 741C. Assume that the op-amp is initially nulled. Calculate

- (a) The voltage gain
- (b) The bandwidth
- (c) The Input Resistance seen by each signal source
- (d) The output resistance
- (e) The output voltage of the amplifier.

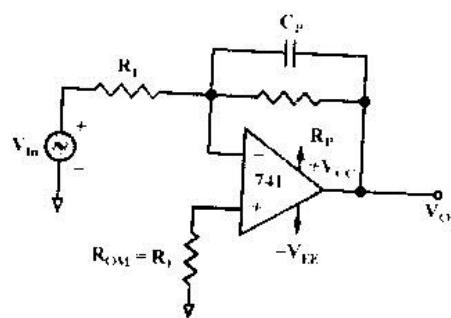


given  $A = 200,000$ ,  $R_i = 2M\Omega$ ,  $R_o = 75\Omega$ ,  
 $VGB \cong 1MHz$ ,  $F_0 \cong 5Hz$ , supply voltage =  $\pm 15V$

### UNIT-II

2. (a) Explain Operation of basic differentiator. Also give reasoning for practical differentiator use. Draw frequency response of differentiator. [10]

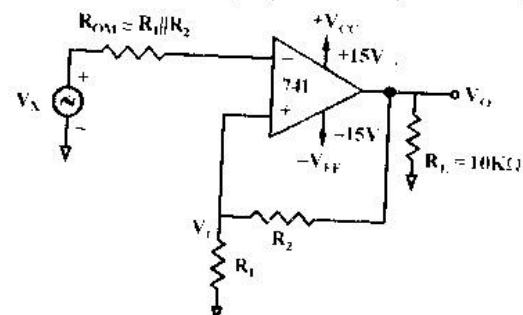
(b) In the circuit shown below, the Input is a Sine wave with a peak to peak amplitude of 5V (Fig.) at 1 KHz. Draw the output voltage waveform if  $R_1 C_f = 0.1$  msec &  $R_f = 10 R_1$ . Assume that the voltage across  $C_f$  is Initially Zero. [6]



OR

2. (a) Explain How oscillations are generated. Give complete circuit diagram to generate sine wave using phase shift oscillator and explain its operation. [8]

(b) Explain the operation with suitable waveforms of the circuit drawn below: [8]



### UNIT-III

3. (a) Design an All-pass filter to have unity gain, phase shift of 60° degree (Voltages  $V_{in}$ ) and the operating frequency of 1 kHz. [8]

(b) Explain the Role of quality factor in determining type of filter characteristics. Draw circuit diagram of Narrow bandpass filter and explain its operation. [8]

OR

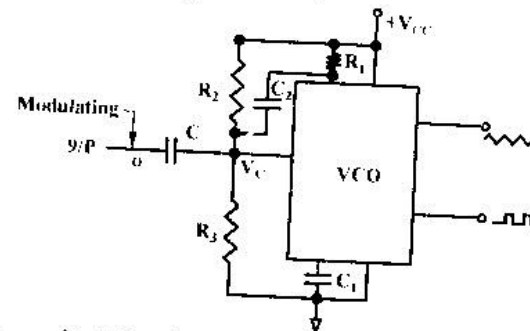
3. (a) Discuss advantages of switched capacitor filter and explain its operating principle. [10]

(b) Give salient features of Chebyshev & Butterworth filters. [10]

### UNIT-IV

4. (a) A voltage controlled oscillator ( $V_{CO}$ ) is shown in Fig. (i) Determine the frequency of the output waveform. (ii) If control voltage ( $V_c$ ) is varied between 9V and 11V, find the change in output frequency. (iii) Draw the square wave output wave if the modulating input is a sine wave.

given  $V_{cc} = 12V$ ,  $R_2 = 2k\Omega$ ,  $R_1 = R_3 = 10k\Omega$  and  $C_1 = 0.001\mu F$ ,  $C_2 = 0.001\mu F$ . [10]



(b) With suitable block diagram, Explain operation of Phase Locked Loop. [6]

OR

4. (a) Describe how we can use PLL as frequency Multiplier. Give required diagrams. [8]

(b) Derive expression for Lock range. Also explain operation of basic phase detector waveforms. [8]

### UNIT-V

5. Write Short Notes on (Any two) [16]

- (a) Four quadrant multiplier.
- (b) Fixed and Adjustable voltage Regulators.
- (c) IC-555 as Monostable Multivibrator
- (d) Op-amp parameters.