



Printed Pages : 4

TEC-502

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3086

Roll No.

B. Tech.

(SEM. V) EXAMINATION. 2008-09 ANALOG INTEGRATED CIRCUITS

Time : 3 Hours]

[Total Marks : 100

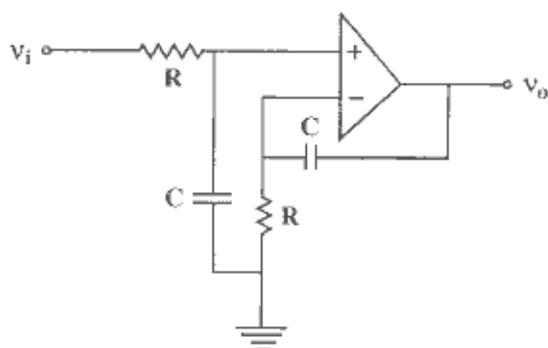
- Note : (1) Attempt all questions.
 (2) Use semilog paper, if required.

1 Attempt any **four** parts of the following : **5×4=20**

- (a) Explain with proper reasons, why :
- (i) The input offset voltage exists in all op-amps.
 - (ii) The R_E in an emitter-coupled differential amplifier replaced by a constant current source.
 - (iii) The CMRR is infinite if a true constant current source is used in a symmetrical emitter coupled differential amplifier.
 - (iv) The gain of the op-amp to roll-off after a certain frequency is reached.
- (b) Explain the working of the following circuit and obtain an expression for its output voltage

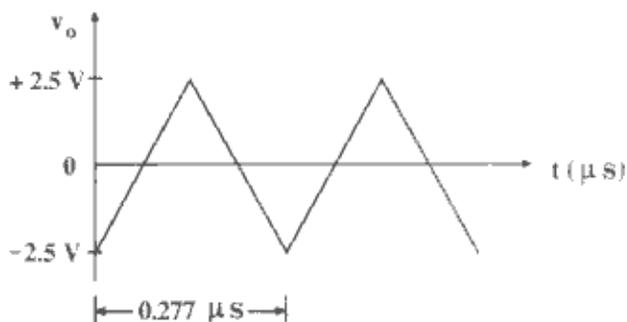
(v_o) :





- (c) Obtain an expression for the common-mode and difference-mode gain of an op-amp.
- (d) Design an op-amp differentiator that will differentiate an input signal with $f_{\max} = 100 \text{ Hz}$. Also draw the output waveform for a sine wave of 1 V peak at 100 Hz applied to the differentiator.
- (e) Explain the input bias current characteristics of op-amp in detail.
- (f) Define slew rate, when an 8 V peak to peak square wave of 3.6 MHz frequency is the input to a voltage follower, the output is a triangular wave, as shown below. What is the slew rate of the op-amp? What must the minimum slew rate of the op-amp be in order to get the square wave output?





2 Attempt any **two** parts of the following : $10 \times 2 = 20$

- Explain the operation of monostable multivibrator by drawing the negative going triggering signal, capacitor waveform and output voltage waveform.
- Draw the circuit of a PLL AM detector and explain its operation. Calculate output frequency f_o , lock range Δf_L and capture range Δf_c of a 565 PLL if $R_T = 10 \text{ k}\Omega$, $C_T = 0.01 \mu\text{F}$ and $C = 10 \mu\text{F}$.
- Draw the circuit of Schmitt trigger using 555 timer and explain its operation. Design a monostable multivibrator using 555 timer to produce a pulse width 100 ms.

3 Attempt any **two** parts of the following : $10 \times 2 = 20$

- Design a wide-band reject filter using first order high-pass and low-pass filter having $f_L = 2 \text{ kHz}$ and $f_H = 400 \text{ Hz}$, respectively and pass band gain is 2. Draw its frequency response on semilog paper.



- (b) Design a 400 Hz active notch filter. Draw the frequency response. Obtain the transfer function for band reject filter.
- (c) Draw the schematic of second order narrow band pass filter. Obtain the expression of the gain and Q at resonance. Draw its frequency response.

4 Attempt any **two** parts of the following : 10×2=20

- (a) (i) Draw the circuit of a log-amplifier using two op-amps and explain its working.
- (ii) Set-up a computer simulation to solve the differential equation :

$$\frac{d^2y}{dt^2} + 5.4 \frac{dy}{dt} + 0.58y = u(t)$$

- (b) (i) Draw a sample and hold circuit. Explain its operation and indicate its uses.
- (ii) Name the circuit that is used to detect the peak value of the non-sinusoidal waveforms. Explain the operation.
- (c) What is an absolute value output circuit ? Draw its circuit and explain its working and also explain how it can be used as full wave rectifier ?

5 Write short notes on any **two** of the following : 10×2=20

- (a) Op-amp regulator
- (b) Fixed voltage regulator
- (c) SMPS.

