

Printed Pages: 3

NEC-501

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

Paper ID : 2012357

Roll No. 

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B.TECH.

Regular Theory Examination (Odd Sem-V), 2016-17

INTEGRATED CIRCUITS

Time : 3 Hours

Max. Marks : 100

SECTION - A

1. Attempt all parts. All parts carry equal marks. Write answer of each part in short. (10×2=20)
  - a) Design a multiple feedback Narrow Band Pass filter with  $f_c = 1 \text{ kHz}$ ,  $Q = 3$  and  $A = 10$ .
  - b) For a first order Butterworth high-pass filter, evaluate the value of  $R$  if  $C = 0.0047 \mu\text{F}$  and  $f_c = 10 \text{ kHz}$ .
  - c) Implement  $F = \overline{AB + \bar{A}B}$  using AND-OR-INVERT logic.
  - d) Why CMOS NAND is preferred over CMOS NOR?
  - e) Name the circuit that is used to detect the peak value of non-sinusoidal waveforms. Explain the operation with neat circuit diagram.
  - f) Draw and explain the generalized impedance converter circuit.

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- g) What is the advantage of widlar current source over constant current source?
- h) For a dual slope ADC,  $t_1$  is 83.33ms and the reference voltage is 100mV. Calculate  $t_2$  if  $V_i$  is (i) 100mV and (ii) 200mV.
- i) Which block of PLL decides capture range? Explain.
- j) State the reasons for the offset currents at the input of the op-amp.

**SECTION - B**

**Attempt any five questions from this section**  
**(5×10=50)**

2. For 555 astable multivibrator  $R_A = 4.7k\Omega$ ,  $R_B = 1k\Omega$  and  $C = 1\mu F$ . Determine the positive pulse width, the negative pulse width, and the free-running frequency. What is the duty cycle of output waveform?
3. Why we need BJT base current compensation mirror circuit? Draw the circuit and express relation between  $I_{ref}$  and  $I_o$  for same.
4. Explain the working of PLL with suitable block diagram. Write down the different applications of PLL.
5. Realize a simpler CMOS implementation of clocked SR flip flop. Also explain the working of circuit.
6. Design a wide band pass filter with lower cutoff frequency  $f_L = 200$  Hz, higher cutoff frequency  $f_H = 1$  kHz and a passband gain = 4?
7. Explain working of precision full wave rectifier with necessary waveform.

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8. Draw the circuit of KHN filter and derive the expression for its voltage gain.
9. Explain the types of phase detector with suitable circuit diagram and input-output waveforms.

**SECTION - C**

**Attempt any two questions from this section**  
**(2×15=30)**

10. Explain the generation of square and triangular waveforms from astable multivibrator Operation using op-amp. Also find expression of the time period for both cases.
11. a) Design a CMOS half adder circuit with inputs A & B.  
b) Derive the formula for  $V_{TL}$  and  $V_{TH}$  of CMOS inverter.
12. Explain the circuit of Wilson MOS current mirror. Also discuss how it can be improved. Draw the circuits and find expression of  $I_o$  for both, Wilson and modified Wilson current mirrors.



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