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Paper Id: 130518 **Roll No.** | | | | | | | | | | |

B TECH

(SEM V) THEORY EXAMINATION 2018-19

INTEGRATED CIRCUITS

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief **2 x 10 = 20**

a. Draw the circuit of basic MOSFET source.

b. Define CMRR, PSRR, I/P bias current of an operational amplifier.

c. Why we need BJT base current compensation mirror circuit?

d. What is the name of the circuit that is used to detect the peak value of non sinusoidal waveform

e. CMOS NAND is better than CMOS NOR! Why?

f. What are the differences between latch and flip flop?

g. Draw the circuit diagram of an inductance simulation circuit.

h. Write the differences between comparator and Schmitt trigger circuit.

i. What is temperature compensated log amplifier?

j. Define free running frequency and pull in time of a PLL.

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a. Explain the circuit of a base current compensated current mirror. Also explain with the help of a neat diagram that how does it provide improvement over simple current mirror circuit.

b. Draw and explain the circuit for the KHN filter using three operational amplifiers. Also design a second order Butterworth low pass filter having upper cut off frequency 2 KHz. Also determine its frequency response.

c. Discuss the differences between clocked SR flip flop and D flip flop. Draw and explain the logic gate symbolic representation of clocked SR flip flop using NOR gate. Also sketch its CMOS circuit implementation and explain its working principle.

d. Define hysteresis voltage. With the help of neat diagram explain the circuit of Schmitt trigger along with its transfer characteristics.What is its applications?

e. Discuss the construction, operation and applications of PLL. Also explain the lock rage and capture range of a PLL.

SECTION C

3. Attempt any *one part* of the following: **10 x 1 = 10**

a. Derive an expression for the output impedance of a cascade current mirror circuit. Also explain the characteristics of Widlar and Wilson current mirror circuit.

b. What is the slew rate? Also derive an expression for the relation between f_t and slew rate of IC 741. Also explain the role of coupling capacitor in IC741 internal circuit.

4. Attempt any *one part* of the following: 10 x 1 = 10

a. Explain the circuits of all pass active filters. Design a wide band reject filter with lower cut off frequency f_L=5KHz, higher cut off frequency f_H= 100Hz and a pass band gain of 4. Also draw the frequency response of that filter.

b. With the help of a neat diagram explain the working of generalized impedance converter (GIC). Also draw and explain the operational amplifier based circuit of V-I converter and derive its output equation for floating load.

5. Attempt any *one part* of the following: 10 x 1 = 10

a. Explain the basic concept of CMOS. Also describe various regions of operation for CMOS inverter over its VTC characteristics. A CMOS inverter has the following parameters: V_{DD} = 5V, $V_{TO,n}$= 0.7V,$V_{TO,p}$= 0.8V, K_n= 210μA / V^2 Calculate the noise margin of this inverter.

b. Draw and explain the circuit of D flip flop using CMOS. Sketch the CMOS logic circuit realization of the following expression:

(i) Z = [P(S+T) + QR]'
(ii) Z = [(S+T+P) (Q+R)]'

6. Attempt any *one part* of the following: 10 x 1 = 10

a. Discuss the differences between log amplifier and antilog amplifier using op amp. Also draw the circuit diagram of an antilog amplifier using op amp and explain its operation. Enlist the possible applications of this circuit.

b. What are the differences between astable multivibrator and monostable multivibrator? Also draw the circuit of half wave presicion rectifier and explain its operation along with its input and output waveform.

7. Attempt any *one part* of the following: 10 x 1 = 10

a. Draw the pin diagram of IC 555 and explain the function of each pin. What are the modes of operation of 555 timer? Design a stable multivibrator with the following specification:
Output frequency f_o= 5KHz and duty cycle of output voltage waveform is 60%. Assume C= 0.047μf

b. What is the duty cycle? Derive the expression for the duty cycle of an astable multivibrator. Also draw the circuit of a triangular wave generator and explain its operation.