PAPER ID-310657

Subject Code: **REC501A**

Roll No: | | | | | | | | | | | | | |

B. TECH
(SEM-V) THEORY EXAMINATION 2020-21
INTEGRATED CIRCUITS

Time: 3 Hours ***Total Marks: 70***

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

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a.	Define and give significance of Slew Rate.
b.	What do you mean by a frequency response of a filter circuit?
c.	Differentiate between Comparator and Schmitt trigger.
d.	Determine the output voltages produced by a DAC whose output range is 0 to 10 V and whose input binary numbers are 10 (for a 2-bit DAC) and 0110 (for a 4-bit DAC).
e.	Draw the CMOS implementation for the expression of X-OR gate.
f.	Give two application of analog multiplier.
g.	Draw a sample and hold circuit.

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a.	Draw the D flip flop using CMOS.
b.	Write short note on the following: (i) Zero crossing detector (ii) Logarithmic amplifier.
c.	Discuss the Frequency Response of 741 Op-amp. Relate unity-gain bandwidth (f_t) and Slew Rate (SR). Give upper and lower 3 dB frequencies of the same.
d.	Realize the transfer function of LPF, HPF and BPF using KHN Biquad.
e.	Design a non-inverting Schmitt trigger with $R_1 = 2k\Omega$, $R_f = 3k\Omega$. Calculate the V_{ut}, V_{lt} and V_{hy} if $V_{sat} = \pm 12$ V. Also draw the output waveform.

SECTION C

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

(a)	**(i)** How is the short circuit protection achieved in the output-stage of 741 op-amp? **(ii)** Explain the circuit of Wilson MOS current mirror. Also, discuss how it can be improved.
(b)	Explain DC Analysis of 741 in term of Small Signal Analysis of input stage, the second stage, the output stage, Gain and Frequency Response of 741.

Roll No: | | | | | | | | | | | | | |

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

(a)	Design a wide-band reject filter using first order high-pass and low-pass filter having f_L = 2 kHz and f_H = 400 Hz, respectively and pass band gain is 2.
(b)	Explain the working of generalized Impedance converter.

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

(a)	Give CMOS implementation of a JK flip-flop and explain its working.
(b)	Sketch the CMOS logic circuit realization of the expression: Y= (A+BC)+D

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

(a)	Design a non-inverting Schmitt trigger with R_1 = 2kΩ, R_f = 3kΩ. Calculate the V_{ut}, V_{lt} and V_{hy} if V_{sat} = ±12 V. Also draw the output waveform.
(b)	Draw the circuit diagram of full wave precision rectifier and find expression for output voltage for both positive and negative half cycle of input sinusoidal waveform.

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

(a)	Draw and explain monostable multivibrator using 555 timer and calculate its time period.
(b)	Draw the block diagram of a PLL and explain its operation. Explain lock-in-range, capture range and pull-in time of a PLL. List the application of PLL.