PAPER ID-310637

Roll No:

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

Q no.	Question	Marks	CO
a.	Obtain an expression for the common mode and difference mode gain of an Op-amp.	2	1
b.	Define slew rate.	2	1
c.	Draw the block diagram of Op-amp and describe each block briefly.	2	1
d.	Determine the duty cycle and frequency of 555 Astable Multivibrator output for C = 0.01µF R_A = 2.2 kΩ and R_B = 3.901 kΩ.	2	5
e.	Discuss the advantages of active filter over passive filters.	2	2
f.	Explain the need of compensation in Op-amp.	2	2
g.	Define lock range and capture range in PLL.	2	5
h.	For a first order Butterworth high pass filter evaluate the value of R if C=0.0047 µF and f_c = 10 kHz.	2	2
i.	Obtain the DC analysis of a circuit?	2	1
j.	Draw basic structure of CMOS inverter.	2	4

SECTION B

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

Q no.	Question	Marks	CO
a.	Describe what is meant by output short circuit protection and explain how it is achieved in the output stage of IC 741 circuit.	10	1
b.	Draw a Sample and Hold circuit. Explain its operation in detail.	10	3
c.	Draw the circuit of antilog amplifier and explain its operation. Explain how two analog voltages are multiplied using log-antilog amplifiers	10	3
d.	Draw the circuit diagram of Instrumentation amplifier using transducers bridge and find the expression of output voltage. Also discuss the advantages of instrumentation amplifier over differential amplifier.	10	2
e.	Draw & explain the circuit of triangular wave generator. How square wave can be obtained using this triangle wave.	10	2

SECTION C

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

Q no.	Question	Marks	CO
a.	Design a Biquad filter with f_o = 8 kHz, BW = 250Hz and a 20dB response gain. What is the value of $H_{OLP?}$	10	2
b.	Explain the operation of square wave generator by drawing the capacitor and output voltage waveforms.	10	3

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

Q no.	Question	Marks	CO
a.	Find out the overall gain of Op-amp IC 741 giving its cascaded equivalent circuit derived for its three stages. Also derive the relationship between f_T and slew rate for IC 741.	10	1
b.	Explain zero crossing detector and voltage comparator with the help of suitable diagram and waveforms.	10	3

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

Q no.	Question	Marks	CO
a.	Give the CMOS implementation of the expression (A(B+C) + DE)'	10	4
b.	Give CMOS implementation of J K Flip-flop and explain its working.	10	4

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

Q no.	Question	Marks	CO
a.	Draw the generalized converter of impedance and derive the equation of impedance. Explain Simulation of Inductor as well.	10	2
b.	Derive the expression of voltage gain in KHN Biquad filter. Draw the KHN Biquad filter and derive transfer function of the BPF and LPF from that.	10	2

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

Q no.	Question	Marks	CO
a.	Draw the functional block diagram of IC 555 and explain its working. Draw the circuit diagram of Monostable Multivibrator using 555 and derive the expression for its time delay.	10	5
b.	Explain the working of PLL using suitable diagram. List the applications of PLL.	10	5