B.TECH
(SEM V) THEORY EXAMINATION 2019-20
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) What is a Current Mirror circuit? Give its need.
   (b) What do you mean by DC analysis of a circuit?
   (c) Describe the need of voltage limiter circuits.
   (d) Differentiate wide band and narrow band pass filter.
   (e) Draw the basic structure of CMOS inverter.
   (f) Differentiate between Comparator and Schmitt trigger.
   (g) The basic step of a 8-bit DAC is 20mV. If 00000000 represents 0V, what is represented by the input 10110111?

SECTION B

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

   (a) Find out the overall gain of an op-amp IC741 giving its cascaded equivalent circuit derived for its three stages. Also drive the relationship between f_T and Slew Rate for IC741.
   (b) Draw the generalized impedance converter and derive its impedance equation. Also simulate an Inductor.
   (c) Discuss the features of CMOS circuit. Realize one AND-OR-INVERT (AOI) and one OR- AND-INVERT (OAI) function using CMOS logic circuit.
   (d) What are precision rectifiers? Describe the working of single op-amp based full wave precision rectifier.
   (e) 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.

SECTION C

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

   (a) Describe what is meant by output short circuit protection and explain how it is achieved in the output stage of IC741.
   (b) Discuss how the reference portion of the CM circuit can be designed with MOSFETs only.

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

   (a) Draw and explain Narrow Band Reject Filter. Also, find its transfer function.
   (b) Derive the expression of voltage gain in KHN Biquad Filter. Draw the KHN Biquad filter and drive transfer function of the BPF and LPF from that.

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

   (a)   Realize the circuit of 2 input NOR gate and 2 input NAND gate using CMOS and explain the operation.

(b) Give CMOS implementation of a SR flip-flop and explain its working.

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

   (a)   What do you mean by the quadrant operation of multiplier? Draw and explain a GILBERT analog multiplier.

   (b)   Draw & explain the working of monostable multivibrator using op-amp.

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

(a) Explain the block diagram of IC 555. Derive the expression for time delay of a Monostable multi-vibrator using 555.

   (b)   Explain the operation R-2R Ladder D/A Converter. OR Explain the operation of dual slope ADC.