

**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.

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