

B.TECH
(SEM V) THEORY EXAMINATION 2022-23
INTEGRATED CIRCUITS

Time: 3 Hours**Total Marks: 70****Note:** 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) Define and give significance of Slew Rate.
- (c) Describe the need of voltage limiter circuits.
- (d) What do you mean by a frequency response of a filter circuit?
- (e) Draw the basic structure of CMOS inverter.
- (f) Differentiate between a peak detector and sample and hold circuit.
- (g) How many resistors are required in a 12 bit weighted resistor DAC?

SECTION B

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

- (a) Give small signal model of transistor. Determine the small-signal model of the second Stage of the 741 op-amp.
- (b) Compare and contrast active filters and passive filters. Design a second order low pass Butterworth filter to have cut-off frequency of 1 KHz and pass band gain of 5.
- (c) Discuss the features of CMOS circuit. Give CMOS implementation of a SR flip-flop and explain its working.
- (d) Describe the working of single op-amp based full wave precision rectifier.
- (e) Explain the block diagram of IC 555. Derive the expression for time delay of a Monostable multivibrator using 555.

SECTION C

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

- (a) What are the desirable characteristics of current mirror circuits? Draw the simple BJT Current mirror and obtain the expression for current transfer ratio using matched transistors.
- (b) Describe how output short circuit protection is achieved in an op-amp circuit.

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

- (a) 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.

- (b) Describe temperature compensated Log amplifier using two op-amps & explain its operation.

5. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Draw the basic structure of CMOS inverter. Realize the circuit of 2 input NOR gate and NAND gate using CMOS and explain the operation.
- (b) Discuss D-F/F circuit using NAND CMOS gates.

6. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Draw & explain the working of a stable multivibrator using op-amp.
- (b) Explain how a Schmitt Trigger circuit works with a neat diagram. Design a Schmitt trigger with $V_{UT} = 2V$, $V_{LT} = -1V$. Assume $\pm V_{sat} = \pm 13V$.

7. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Explain the operation of dual slope ADC.
- (b) Draw the block diagram of a PLL and explain its operation.

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