1315

B.Tech. (Semester-V)

(SPL.) THEORY EXAMINATION, 2014-15

INTEGRATED CIRCUITS

Time : 3 Hours]   *[Total Marks : 100*

Note: All questions are compulsory and carry equal marks.

1.   Attempt any <u>four</u> parts. All parts carry equal marks.

                                               $5 \times 4 = 20$

     (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) Explain the circuit of Wilson MOS current mirror. Also discuss how it can be improved.

     (c) The parameter of the three transistor CM are $V_{CC} = 9$ V, $V_{EE} = 0$, $R_1 = 12$ KΩ, $V_{BE(on)} = 0.7$ V, $\beta = 75$, $V_A = \infty$. Calculate the value of current, I_{ref}, I_0, I_{C1}, I_{B1}, I_{B2}, I_{B3}, I_{E3}.

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(d) What is the need for compensating base current of bipolar mirror?

(e) Describe the operation and characteristics of a BJT complementary push-pull output stage.

(f) Describe what is meant by output short circuit protection.

2. Attempt any two questions. All questions carry equal marks: 10×2=20

(a) Compare and contrast active filters and passive filters. Design a second order low Pass Butterworth filter to have cut-off frequency of 1 KHz.

(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.

(c) (i) Draw the V-I converter and derive its output equation for grounded load.

(ii) Derive the output expression for RC Phase Shift Oscillator.

3. Attempt any two questions. All questions carry equal marks: 10×2=20

(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.

(c) Discuss the features of CMOS circuit. Realize one AND-OR-INVERT (AOI) and one OR-AND-INVERT (OAI) function using CMOS logic circuit.

4. Attempt any two questions. All questions carry equal marks: 10×2=20

(a) Draw and explain the working of monostable multivibrator using op-amp.

(b) What are precision rectifiers? Describe the working of single op-amp based full wave precision rectifier.

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

5. Attempt any two questions. All questions carry equal marks: 10×2=20

(a) 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.

(b) Explain the operation R-2R Ladder D/A Converter.

(c) Design a 555 timer as a stable multivibrator giving its block diagram which provide an output signal frequency of 2 KHz and 75% duty cycle.

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