Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SEVENTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION
DECEMBER 2018
SUBJECT: ANALOG AND MIXED SIGNAL DESIGN (ECE - 4013)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Design a RLC band-pass biquad using active transconductor blocks with a Q of 10 and a cut-off frequency of 1.59 MHz Give comments about sensitivity and tenability.

1B. Discuss the merits and demerits of fully differential design in mixed signal design. Illustrate the realization of fully differential Gm-C integrator circuit.

1C With neat diagram explain compensation of finite Bandwidth effects in Operational Trans conductance amplifiers.

(4+3+3)

2A. Discuss the design methods and layout guidelines employed in Analog and Mixed-Signal Circuit Design with respect to following:
[i] Floor Planning [ii] Power supply and grounding issues [iii] Fully Differential Design

2B. With neat diagram of Analog design octagon explain trade-offs and challenges present in the design of high performance amplifiers.

(5+5)

3A. Design a current sink using $V_{DD} = -V_{SS} = 2.5V$ to sink a current of 10 µA. Using the 10µA n-channel reference, design three current sources of values 10 µA, 20 µA and 50µA. Estimate the variation in I_o for the same current mirror for V_{DD} changing from 2.4 to 2.6V. Assume L=5µm, Kn=50 µA/V^2, λ=0.06/V, Vthn=0.83 V, V_{GS}=1.2V.

3B. Give the general block diagram of Tow-Thomas biquad. Design a Gm-C Low pass biquad for a pole frequency of 10 MHz and Q_p of 10 using i) Tow Thomas structure ii) Distributive feedback structure. Compare both structures

(4+6)

4A. Design a 3 bit charge scaling DAC and determine the value of the output voltage for $D_2D_1D_0$ =010 and 101. Assume V_{REF}=5V and C=0.5pF. What is the drawback of this converter and how is it overcome?

4B. Draw the circuit diagram of a sinusoidal oscillator employing two OTA's and 3 capacitors. Write the expression for frequency of operation.

4C. Give the internal circuit of CMOS Operational Trans conductance amplifier and explain the OTA performance parameters.

(4+3+3)

5A. Discuss the differences between Nyquist rate ADC's and Oversampling ADC's. Sketch and explain the block diagram of first order sigma delta modulator. Use a time discrete integrator with the transfer function H (z) =1/Z-1.

5B. Give OTA implementation of:

i) Floating Inductance

ii) ii) resistor in a differential form.

Write the equivalent expression for inductance and resistance.

(5+5)