



Name :

Roll No. :

Invigilator's Signature :

CS/M.TECH(ECE-OLD)/SEM-2/MC-201/2011

2011

RF MICROELECTRONICS & VLSI DESIGN

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Short Answer Type Questions)

Answer the following questions. $5 \times 2 = 10$

1. In an RF circuit, find out the value of '1-dB compression point' due to non-linear effect.
2. For an RF receiver circuit, find the value of 'spurious-free dynamic range (SFDR)' where $NF = 9\text{dB}$, $P_{iip3} = -15\text{ dBm}$, $B = 200\text{ kHz}$, $SNR_{\min} = 12\text{ dB}$.
3. Calculate the threshold voltage (V_{th}) of a CMOS inverter, where $V_{DD} = 5\text{V}$, $V_{To,n} = 1.0\text{V}$, $V_{To,p} = -1.0\text{V}$ and $K_r = 2.5$.



4. Draw the circuit diagram of a clocked NOR based 'SR latch' circuit (using CMOS logic).
5. For a current sink circuit, find out the small signal output resistance (r_{out}), where $\lambda = 0.04$ and $I_d = 0.1$ mA.

GROUP – B

(Long Answer Type Questions)

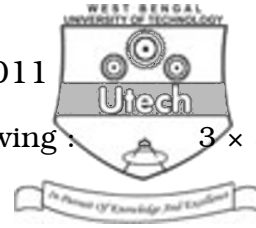
Answer any *four* of the following. $4 \times 15 = 60$

6. a) Explain that 'RF section' is still the design bottleneck of wireless communication system.
- b) Write down the applications of the RF technology.
- c) In a digital transmitter or receiver system which part is related with RF electronics ? $7 + 5 + 3$
7. a) Discuss different types of non-linear effects of RF circuits.
- b) What is Inter Symbol Interference (ISI) ? Explain it. $10 + 5$
8. a) Define the following parameters of the mobile RF communication system :
- i) Co-channel interference
 - ii) Hand-off
 - iii) Path-loss and multipath fading
 - iv) Diversity.



- b) What is the difference between Heterodyne and Homodyne receivers ?
- c) In the Hartley architecture, calculate relative gain imbalance. 8 + 4 + 3
9. a) Discuss the basic fabrication steps of MOSFET.
- b) Describe CMOS n-Well process.
- c) What is the difference between full-custom design flow & semi-custom design flow ? 8 + 4 + 3
10. a) State the operation of CMOS inverter and calculate the V_{th} of the CMOS inverter.
- b) What is the difference between Dynamic and Domino CMOS logic ?
- c) Describe the advantages of Transmission-gate (TG) logic. (5 + 3) + 4 + 3
11. a) State the operation of the CMOS differential amplifier using current mirror load.
- b) State the operating principle of an MOS diode.
- c) State the advantages of CMOS when it is acted as a switch. 7 + 5 + 3

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12. Write short notes on any *three* of the following : 3×5

- i) Current Sink circuit
- ii) Cascode amplifier
- iii) Simplified VLSI design flow
- iv) 'MOSFET' as a switch
- v) High efficiency power amplifier.

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