Indian Institute of Engineering Science and Technology, Shibpur

M.E.(ETC) 2nd Semester Final Examination, May, 2014

RF IC and RF MEMS (ETC 1035)

Second half

Marks: 35

Answer any three questions

2 marks are reserved for neatness

1.a) What is the importance of MEMS based capacitors and inductors in RF circuits?

b) Explain the working principle of a MEMS capacitor and derive the expression of capacitance3 with applied voltage. Why the structure of a MEMS capacitor snaps after a critical voltage?

(4+7)

2.a) Discuss a method to increase the tunability of capacitance variation with voltage in a 2 plate structure. Derive the expression of the pull down voltage.

b) In a 2 plate MEMS capacitor, if the 2D deformation has to be considered, then discuss a methodology to evaluate the variation of capacitance with applied voltage.

(6+5)

3.a) Can 3 plates be used in a MEMS capacitor to increase the tunability of capacitance? Explain.

b) Draw an equivalent circuit to represent MEMS inductor formed (i) bulk micromachining from the back side (ii) bulk micromachining from the front side. Compare their Q-factors.

(5+6)

4.a) Discuss a method to increase the tuning range of a parallel plate MEMS capacitor using a levering structure.

b) Derive the approximate expression for capacitance and pull down voltage considering surface roughness of hemispherical shape in a two plate MEMS capacitor.

(4+7)

5) Write short notes on the following:

i) Fabrication of 3 plate MEMS capacitor

ii) Fabrication of high-Q MEMS inductor

(6+5)