BITS, Pilani, KK Birla Goa Campus

FIRST SEMESTER 2019-2020

BITS F417 Microfluidics and its applications

Mid Term Examination (Closed Book)

DATE: 28/09/2019 Time: 4:00-5:30 PM Maximum Marks: 60

Instructions:

- All parts of a question must be answered at a single place.
- Support your answer with neat sketches where ever necessary

1. Describe Lennard-Jones Model with a generalized plot of intermolecular potential energy and force. What are the limitations of Lennard-Jones Potential?

[15 M]

2. Name the key steps involved in Direct Simulation Monte Carlo technique. What are the drawbacks and limitations of DSMC? Brief on the limitations.

[4 +5+5 = 14 M]

3. In microfabrication, provide the schematic of pattern transfer through additive technique.

[7 + 3 = 10 M]

4. (a) Surface tension has vexed microsystem designers since they began building devices that are meant to be filled with liquid. Ex. Removal of SiO_2 from under a layer of silicon is simple wet etch. The surface tension may cause difficulty in removing the liquid and may even break the silicon surface. Discuss on this phenomenon.

(b) What is the slip velocity for the fluid water + glycerin on the surface of acrylic resin if the contact angle is 150° and surface roughness is 100 μm. The shear rate is 100 s^{-1} and the slip percentage $\delta_\lambda = 0.97$, periodicity is $L_\lambda = 0.03$ and the slip length is 450 μm.

[4+3 = 7 M]

5. State the classifications of Electrokinetic phenomena. Discuss on the Electrical Double Layer with neat sketches.

[4+6+4=14 M]
