

[Time: 03 Hours]

Q.P. Code :08593

[Marks: 80]

Please check whether you have got the right question paper.

- N.B:
1. Q1. Is compulsory.
 2. Attempt any three out of remaining.
 3. Assume any suitable data required but justify the same.

- Q.1 a) What is the need of Lift off method? Explain this method with proper diagrams. 20
- b) What is the stiffness constant of microcantilever beam for following given dimensions and a point contact load applied at its tip. $E=170\text{GPa}$, $h(\text{thickness}) = 10\mu\text{m}$, $w(\text{width})=2\mu\text{m}$ & $L(\text{Length}) = 50\mu\text{m}$
- c) Explain wafer bonding and its techniques.
- d) Explain scaling of MEMS devices.
- Q.2 a) Explain any one MEMS device used in modern automobile systems with working principle and representative fabrication process steps. 10
- b) Justify the need of PECVD with its proper schematic and explanation. 10
- Q.3 a) Explain fabrication of any one of the MEMS devices using Bulk micromachining technique. 10
- b) Explain the importance of etch stop techniques with proper illustration. 10
- Q.4 a) Explain the fabrication process steps for microheater. State its advantages over conventional macro sized heater. 10
- b) Name any two polymer materials for MEMS device fabrication. Also explain the importance of these polymer materials for MEMS device fabrication with suitable examples. 10
- Q.5 a) Describe the representative process flow for fabricating the Digital Micro mirror Device (DMD) by Texas Instruments. Also explain its working principle. 10
- b) Define the term TCR. Also describe the method of characterization of TCR. 10
- Q.6 Write Short notes on 20
- a) DRIE & its significance for MEMS device fabrication.
 - b) Surface micromachining
 - c) TCE of a material and its issues.
 - d) Si as a MEMS material
