

M. Sc (Instrumentation) 1st Year, 2nd Semester Examination, 2017**Subject: Thin Films and MEMS Technology****Time: 2 Hours****Full Marks: 50****Part-I****Answer any four questions from 1-6: question 7 is compulsory**

1. State the differences between island growth and layer growth.
What are the major origins of stresses in thin film? 3 + 2
2. Describe sputtering technique for thin films deposition. What are the differences in dc and rf sputtering techniques? 3 + 2
3. What are compressive and tensile stresses in thin films? How one may control stress in thin films? 3 + 2
4. What are the basic differences in LPCVD, PECVD and MOCVD techniques in depositing thin films? Describe any one of them in detail. 2 + 3
5. Name the different techniques of determining thickness of a film. Describe the optical technique (Fizeau) for determining the thickness of a film. 2 + 3
6. What are the common substrate requirements? Describe common cleaning procedure for cleaning: (a) glass substrate and (b) silicon wafer substrate. 2 + 3
7. Short questions (any two) 2.5 x 2
 - (i) Adhesion of thin films
 - (ii) Nd-YAG Laser
 - (iii) E-beam evaporation
 - (iv) Ultrasonic cleaning of substrates

Part-II**Answer any two questions:**

8. What is photo-lithography? What are the essential properties of a good photo-resist? What are the compositions of positive photo resist? What are the performance factors of a photo resist? Describe the basic steps of photolithography. 1+2+3+2+4.5=12.5
9. What is MEMS Technology? What are the applications of MEMS technology? What is Wafer bonding? Describe one process of wafer bonding and discuss its merits and demerits. 1+3+1+7.5=12.5
10. Describe various steps of Bulk Micromachining. Describe any process of (with suitable figure) Bulk Micromachining. 6+6.5=12.5
11. Describe different parts of a pressure sensor. Describe how one can fabricate pressure sensor by using MEMS technology. 4.5+8