

03 Hrs

[Total Marks 80]

N.B.:

- (1) **Question No.1 is compulsory**
- (2) Attempt any **three** questions out of remaining **five** questions
- (3) Figures to right indicate full marks
- (4) Assume suitable data if **necessary**.
- (5) Notations carry usual meaning.

1. (A) List at least three applications of MEMS in Health care industries. **05**
 (B) Illustrate the working principle of MEMS bio-medical sensors. **05**
 (C) Illustrate surface micro-machining process in micro-domain. **05**
 (D) Illustrate deep reactive etching process. **05**
2. (A) Identify at least five etchants used for wet etching process. **06**
 (B) Explain electromagnetic type of actuation principle used in Micro-domain. **06**
 (C) Illustrate the construction and working of an air bag deployment system in an automobile. **08**
3. (A) Discuss in detail various factors affecting the material removal rate in Ion-beam machining. **08**
 (B) Explain microstereolithography process in MEMS. **06**
 (C) Illustrate isotropic and anisotropic etching process. **06**
4. (A) Explain modelling of Micro-channels in micro domain. **06**
 (B) Enumerate and illustrate the different steps involved in FEM analysis of MEMS components/ Systems. **08**
 (C) Enlist any four scaling laws in MEMS and illustrate any one in detail. **06**
5. (A) Draw the constructional block diagram and working principle of Atomic Force Microscope (AFM) for the characterization of MEMS devices **10**
 (B) Draw the constructional block diagram and working principle of Scanning Electron Microscope(SEM) for the characterization of MEMS devices. **10**
6. (A) Write at least five domestic and industrial applications of Nano technology. **06**
 (B) List three different techniques used for the fabrication of Carbon Nano Tubes and illustrate any one method in detail. (CNT). **08**
 (C) Illustrate NEMS with its applications. **06**
