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B. TECH.
(SEM VII) ODD SEMESTER THEORY EXAMINATION 2016-17
MICRO & SMART SYSYEM

[Time: 3 hrs.] **[Max. Marks: 100]**

Note- ***Attempt All Questions. All Questions carry equal marks*****:-**

Q1 Attempt any four parts of the following:- **[5x4=20]**

(a) What are Microsystems and MEMS?
(b) Draw the block diagram of a Smart system.
(c) Enlist the list of smart materials and structures used in micro systems.
(d) Classify the Integrated micro system and explain each of them in short.
(e) Discuss some applications of smart materials and micro systems.
(f) Define micro-sensor and micro-actuator.

Q2. Attempt any four parts of the following:- **[5x4=20]**

(a) Enlist the advantages and applications of silicon capacitive Accelerometer
(b) Define piezoresistive pressure sensor? Also give some applications and its advantages.
(c) How conductor metric gas sensor works?
(d) Define an electrostatic comb-drive and explain its application.
(e) Give the principle of operation of portable blood analyzer.
(f) Fabrication of Micro-mirror array for video projection

Q3. Attempt any *two* parts of the following:- **[10x2=20]**

(a) Draw the flow chart of various processes involved in the fabrication of micro systems. Explain each process in short.
(b) Derive an expression for the thickness of silicon consumed while forming a 1μm thick oxide layer. A (100) silicon wafer is 500 μm thick. A mask consists of rectangular window of unknown size. The sides of the window are parallel to <100>. After each wafer etch a hole size of 50μm × 80μm is formed on the other side of the wafer. Find the size of the mask window. The undercut rate is negligible.
(c) Explain the various advanced processes for microfabrication in brief with suitable diagrams.

Q4. Attempt any *two* questions of following:- **[10x2=20]**

(a) In a plane-strain condition, all the strains involving the z-direction are zero. Derive the stress-strain relationship between stress and strains in the x and y directions.
(b) Explain the principle of energy method for elastic bodies with diagram. Also explain bimorph effect.
(c) Explain the working principle of spring restrained parallel-plate capacitor for coupled electromechanics. Give its applications.

Q5. Write short note on any **three parts** of the following **-** **[20]**

(a) Scaling effect in Microsystems.
(b) Microsystems packaging challenges and possible solutions.
(c) Smart structures in vibration control.
(d) Piezoelectric inkjet print head