Registration no: | | | | | | | | | | |

Total Number of Pages: 02 **B.Tech**
PEEI5405

8th Semester Regular / Back Examination 2016-17
MICRO ELECTRO MECHANICAL SYSTEMS
BRANCH:ECE, ETC
Time: 3 Hours
Max Marks: 70
Q.CODE:Z217
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** **(2 x 10)**

a) What is a microsystem? Give some examples.
b) Define micromachining. Mention some micro-machined components.
c) Differentiate between Microsensors and Micro actuators with examples.
d) Name the building blocks of a typical smart system? Mention their equivalent in a biological environment.
e) What do you mean by epitaxial growth of Silicon?
f) What do you understand by Electro-thermal flow? Where is it used?
g) Differentiate between wet and dry oxidation.
h) What is the principle of operation of MEMS Accelerometer?
i) Enlist the advantages of LIGA.
j) Mention two applications of RF MEMS

Q2 **a)** What etchants would you select for etching Silicon Dioxide, Poly-silicon, Silicon Nitride and Silicon? **(2)**
b) Discuss the steps involved in both wet and dry etching. **(8)**

Q3 **a)** Enlist the relative Merits of Piezoresistive, Capacitive and Electromagnetic Sensing Methods. **(3)**
b) Discuss the sequence of process of Ion implantation with proper illustrations. **(7)**

Q4 **a)** Discuss different wafer bonding techniques. **(5)**
b) Discuss some Microsystem Packages. Define Stiction. How can it be avoided? **(5)**

Q5 **a)** Discuss the process of Evaporation and Sputtering with suitable illustrations. **(5)**
b) What is CVD? What are the parameters that influence CVD? Compare between different CVD techniques based on temperature and pressure of operation and material used **(5)**

Q6 **a)** Enlist some limitations of photolithography. Compare between optical lithography and soft lithography. **(5)**
b) Discuss the Bulk Micromachining technique in details with suitable examples and illustrations. **(5)**

Q7 **a)** Detail the steps involved in the fabrication of MEMS Inductor. **(5)**

b) Find the spring constant for an axially loaded silicon beam of length 100μm and square cross-section of 2 μm on a side. Use a value of 160 GPa for the Young's modulus of silicon. **(5)**

Q8 **Write short answer on any TWO:** **(5 x 2)**

a) MEMS Gyroscope

b) PDMS

c) Pressure Sensors

d) Beam Splitter