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

Total Number of Pages: 02

B.Tech
PEEI5405

8th Semester Regular / Back Examination 2015-16
MICRO ELECTRO MECHANICAL SYSTEMS
BRANCH: AEIE, EIE, IEE, MANUFAC, MANUTECH, MECH

Time: 3 Hours
Max Marks: 70
Q.CODE: W170

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Assume suitable values wherever missing

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

a) What is the range in size of MEMS components?
b) Define the role of sensors and actuators in the context of MEMS.
c) Discuss the properties of materials used in MEMS fabrication.
d) Enumerate the Biomedical Application of MEMS.
e) Why silicon is used in Microsystems?
f) Why is scaling laws important while learning about Microsystems?
g) What is the basic difference between Bulk micromachining and Surface micromachining?
h) Give the applications of bio MEMS and Optical MEMS
i) A plane intercepts the x-, y- and z-planes at 2, 3 and 4 respectively. Obtain the equation for the plane. Write down the Miller indices for this plane.
j) Enlist some single crystal growth techniques.

Q2 **a)** What are the building blocks of a smart system? **(5)**
What is the purpose of the following smart system components? Also mention their analogous biological system.
Sensor
Control System
Data Bus
Actuator

b) Enlist some two structural and two sacrificial materials. Using any microstructure as an example show the difference between these two materials. **(5)**

Q3 **a)** Enlist some techniques employed for thin film deposition. What is spin coating? Use illustrations to aid your answer. **(5)**

b) What is CVD? Which parameters significantly influence the rate of CVD? Enlist the different types of CVD techniques and mention the typical material deposited using each technique. **(5)**

Q4 What are the various steps undertaken in the process of Photolithography. Draw the steps involved in lift-off process of patterning. (10)

Q5 a) Discuss two wafer bonding techniques with suitable illustrations. (5)

b) What are the applications of Micro fluidic systems? What are the advantages of Lab on chip? (5)

Q6 a) What is LIGA? Discuss the LIGA process in detail. Mention some of its applications. (8)

b) If the compliance of a spring is given as 200N/m. Calculate the Force required to stretch the spring through a displacement of 40 micrometer. (2)

Q7 a) What is a Beam Splitter? Discuss its operation. (5)

b) Enlist the advantages and application of RF MEMS. (5)

Q8 Write short notes on any two: (5 x 2)

a) Diffusion

b) LTCC

c) Issues in packaging

d) MEMS Gyroscope