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Total Number of Pages : 02

B.Tech  
PEI7J005

7<sup>th</sup> Semester Regular Examination 2019-20

MEMS

BRANCH : AEIE, EIE, IEE

Max Marks : 100

Time : 3 Hours

Q.CODE : HR117

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- What do you mean by SOC?
- Illustrate the electrostatic actuation mechanism for RF MEMS devices?
- Define micromachining. Enlist different micro-machined components.
- Write the difference between wet and dry oxidation.
- What types of magnetic materials are used in MEMS?
- State the principle of pressure sensors.
- Write the principle of operation of MEMS Accelerometer.
- What do you understand from lift-off technique?
- Enlist various application areas of MEMS devices.
- Differentiate between pull-in voltage and pull-up voltage for MEMS switches.

Part- II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- Illustrate the important advantages of using RF MEMS as compared to traditional systems?
- Enlist various micro-sensing mechanisms for MEMS devices.
- What do you understand from Ion Implantation Process? Briefly explain its various steps.
- Compare surface and bulk micromachining techniques in MEMS.
- What are macro and micro fluids? Give some applications.
- Illustrate the wet etching process using suitable diagram.
- Discuss the steps involved in LTCC process by using suitable illustrations.
- Explain different wafer bonding techniques.
- Discuss in detail about the failure mechanisms and power handling characteristics of MEMS devices.
- What is CVD? Explain the different parameters that influence CVD?
- Fabricate a Cantilever beam using Bulk Micromachining and Surface Micromachining technique and compare between these two techniques. Use suitable illustrations.
- How do polymers are used in the area of microsystem design? Enlist characteristics of polymers.

**Part-III**

**Only Long Answer Type Questions (Answer Any Two out of Four)**

- 210 **Q3** 210 Write the principle of operation of MEMS resonator. Explain different types of MEMS resonator using neat sketches. **(16)** 210
- Q4** a) Enlist some limitations of photolithography. Compare between optical lithography and soft lithography. **(8)**  
b) Discuss the process of Evaporation and Sputtering with suitable diagrams. **(8)**
- 210 **Q5** 210 How does an MEMS gyroscope work? Define coriolis force and coriolis acceleration. Discuss the compensation techniques used in process of fabricating the gyroscope. Also explain the meaning of DSA. **(16)** 210
- Q6** Write short answer on following : **(8 x 2)**  
a) LIGA  
b) PDMS 210 210 210 210 210 210 210