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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SET A**

**SCHOOL OF ENGINEERING  
END TERM EXAMINATION - JAN 2024**

**Semester :** Semester VII - 2020

**Course Code :** ECE3042

**Course Name :** Mems and Nanotechnology

**Program :** B.Tech.

**Date :** 05-JAN-2024

**Time :** 9:30AM - 12:30 PM

**Max Marks :** 100

**Weightage :** 50%

**Instructions:**

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

**PART A**

**ANSWER ALL THE QUESTIONS**

**4 X 5M = 20M**

1. A substrate refers to *the underlying material or fabric on which various processes, treatments, or coatings are applied*. What is the role of the substrate in microelectronics.  
(CO1) [Knowledge]
2. Distinguish between the photo-resist and non-photo-resist. Where photo-resist being used. Show with some examples.  
(CO2) [Knowledge]
3. Give the circuit diagram of typical switch configuration. Explain what are the disadvantages of the mechanical switches and electronics switches that gives way to the MEMS switches.  
(CO3) [Knowledge]
4. In most power electronic circuits, an inductor is a passive part that stores energy when electricity is delivered to it in the form of magnetic energy. An inductor's ability to oppose or impede changes in the quantity of current passing through it is one of its essential characteristics. Give all the Schematic diagram of common planar inductors.  
(CO4) [Knowledge]

**PART B**

**ANSWER ALL THE QUESTIONS**

**5 X 10M = 50M**

5. MEMS can act as both sensors and actuators. Justify this statement by giving some relevant examples.  
(CO1) [Comprehension]
6. Explain the key processes involved in photolithography with neat diagram showing all the steps.  
(CO1,CO2) [Comprehension]

7. Micro Electro Mechanical System is a system of miniaturized devices and structures that can be manufactured using microfabrication techniques. Explain the steps involved in Bulk Micromachining with neat block diagram. Give some examples or applications where this mechanism is used.  
(CO1) [Comprehension]
8. Explain the actuation mechanism in the RF switch with respect to capacitive actuation. Explain with neat diagram showing both the method.  
(CO3) [Comprehension]
9. How you define the quality factor of MEMS inductor. Based on the equation given how the associated resistance and inductance will affect the quality factor. What the different tuning mechanism that may be used to improve the quality factor.  
(CO4) [Comprehension]

### **PART C**

**ANSWER ALL THE QUESTIONS**

**2 X 15M = 30M**

10. How you define the piezoelectricity phenomenon. Give the mathematical expression showing direct and indirect piezoelectric behaviour. Explain why some materials shows the property of piezoelectricity and some may not. Explain with neat diagram. Give some examples of both manmade and natural occurring piezoelectric material.  
(CO2,CO1) [Application]
11. The characteristics of the micro and nano dimensional materials used for the fabrication of MEMS inductors differ significantly from the from their bulk properties. What are the key parameter that is involved in the design of MEMS inductor. Discuss its effect on the inductor quality. Also Explain how to reduce the stray capacitance in the MEMS Inductor.  
(CO3,CO4) [Application]