Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2021

Subject Code:3172014 Date:17/12/2021

Subject Name:MEMS and Nano Technology

Time:10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	What is MEMS stand for? How does it work in Nanotechnology?	**03**
	(b)	What are the tools available to make the nanostructures? Explain any one.	**04**
	(c)	Describe the various domain applications of MEMS devices.	**07**
Q.2	**(a)**	Justify: At the nanometer scale, properties become size dependent.	**03**
	(b)	Give the comparison between Microelectronics and Microsystems	**04**
	(c)	With a neat diagram explain the working of an Intelligent Microsystems.	**07**
		OR	
	(c)	Explain the Czochralski method for producing single-crystal silicon.	**07**
Q.3	**(a)**	In comb drive actuators used in micro grippers, normal plate electrode technique is better suited as compared to sliding plate one". Evaluate.	**03**
	(b)	Explain difference between Squeeze film and damping in shear.	**04**
	(c)	How is the silicon ingot produced? Explain the process with a neat sketch.	**07**
		OR	
Q.3	**(a)**	What are the types of carbon nanotubes?	**03**
	(b)	Explain creep is a temperature independent phenomenon.	**04**
	(c)	Using a nest sketch explain the construction and working of a MEMS Pressure sensor.	**07**
Q.4	**(a)**	Explain working principle of Chemical Vapor Deposition process.	**03**
	(b)	Why Electromagnetic force is not used for actuation of MEMS devices?	**04**
	(c)	What are the qualities desired for a substrate to be considered in Micro fabrication? Explain with an example.	**07**
		OR	
Q.4	**(a)**	What is Etching explain?	**03**
	(b)	Discuss the significance of scaling laws in Miniaturization with reference to Geometry and Rigid body dynamics.	**04**
	(c)	Discuss various substrate materials and justify the use of silicon as an ideal substrate material.	**07**
Q.5	**(a)**	Explain Spectroscopy.	**03**
	(b)	Classify the techniques used to make nanostructures. Explain any one.	**04**
	(c)	Describe the methods available for making nanostructures. Differentiate between SEM and TEM.	**07**

OR

Q.5	**(a)**	Why traditional manufacturing techniques cannot be used at micro level?	**03**
	(b)	Write in brief: Ion Implantation process	**04**
	(c)	Explain the merits and demerits of micro actuation techniques used in MEMS devices.	**07**

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