Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VIII EXAMINATION – SUMMER 2015

Subject Code: 180303 **Date:05/05/2015**

Subject Name: Biomedical Microsystems

Time:10.30AM-01.00PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	What are two types of wire bond that may be used? Describe them.	**07**
	(b)	What is the purpose of encapsulation? Describe how encapsulation is utilized in the DMD.	**07**
Q.2	**(a)**	An actuation method for a resonator that operates at *10 kHz* with a *2-μm* peak-to-peak stroke needs to be designed. Assume the total suspension spring constant is *1 N/m*. What type of actuation would you choose and why?	**07**
	(b)	Design a thermal actuator to achieve *7 μm* of total travel. Assume that a surface micromachining process with a *2-μm* layer thickness. Heat material to *400°C* for actuation. a. Explain the advantages and disadvantages of your design. b. How much force is produced at *0-μm* stroke? c. How much force is produced at *7-μm* stroke?	**07**
		OR	
	(b)	Compare the advantages and disadvantages of the nested anchor vs. the staggered anchor.	**07**
Q.3	**(a)**	What are the types of design rule errors? What is their significance?	**07**
	(b)	Explain Squeeze Film Damping Model.	**07**
		OR	
Q.3	**(a)**	Give four examples of lattice defects. What is activation energy?	**07**
	(b)	Describe the annealing process for polysilicon. List two reasons for annealing a deposited film.	**07**
Q.4	**(a)**	What are the difficulties involved in integrating microelectronics with MEMS?	**07**
	(b)	Explain the effect of the volume/surface area ratio on the thermal characteristics of a system as the scale is reduced.	**07**
		OR	
Q.4	**(a)**	Discuss the biomedical applications of gold nanoshells.	**07**
	(b)	Explain the miocrodevice loading and release mechanisms.	**07**
Q.5	**(a)**	List diagnostic and therapeutic applications of metal nanoshells.	**07**
	(b)	Explain the biocompatible quantum dots for ultrasensitive, real-time biological imaging and detection.	**07**
		OR	
Q.5	**(a)**	Explain the potential uses of nanotechnology in pulmonary diseases	**07**
	(b)	Explain the process for creating silicon dioxide microdevices.	**07**

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