Reg. No. : | | | | | | | | | | | | |

Question Paper Code: UB701

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Professional Elective

Biomedical Engineering

21BMV701 BIO-MEMS AND NANO ELECTRONICS

(Common to All branches)

(Regulations 2021)

Duration: Three hours | Maximum: 100 Marks

Answer All Questions

PART A - (10 x 2 = 20 Marks)

1.	List the advantages of using Gallium Arsenide over silicon in MEMS applications.	CO1-U
2.	Mention the importance of the process of doping in MEMS fabrication.	CO1-U
3.	Define thermo-mechanics in the context of MEMS design.	CO1-U
4.	List out the applications of MEMS technology in medical equipment design.	CO1-U
5.	Differentiate molecular transportation and molecular sortation.	CO1-U
6.	How has technology influenced current medical practice in diagnosis and treatment?	CO1-U
7.	What is the principle behind displacement nano-sensors in biomedical applications?	CO1-U
8.	List out the importance of cellular bio scanning in Nano sensor.	CO1-U
9.	How are Nano materials used in cancer treatment?	CO1-U
10.	List out the disadvantages of using nanotechnology in medicine.	CO1-U

PART – B (5 x 16= 80 Marks)

11.	(a)	(i) Compare the properties of various materials used for MEMS technology.	CO1-U	(8)
		(ii) Briefly explain the major micromachining techniques used in MEMS manufacturing	CO1-U	(8)

Or

	(b)	Describe the LIGA process in MEMS manufacturing. What are the key steps involved, and how is it used to create high-precision MEMS components?	CO1-U	(16)
12.	(a)	Analyze the effects of mechanical vibration on MEMS devices. How do vibration-related issues impact the performance of mechanical sensors and actuators, and what design strategies can be used to minimize these effects?	CO4-Ana	(16)
		Or		
	(b)	Analyze the working principles of a piezoelectric inchworm motor. How does the motor convert electrical energy into mechanical motion, and what are the critical factors influencing its precision and efficiency in micro-positioning systems?	CO4-Ana	(16)
13.	(a)	Considering the evolution of bedside practice, how would you integrate nano-medical technologies into a hospital setting for real-time patient monitoring? What challenges would arise in implementing these technologies, and how could they transform patient care?	CO3-App	(16)
		Or		
	(b)	In the context of the evolution of scientific medicine, how would you integrate nano-medical interventions with traditional medical practices to treat inflammatory diseases? Discuss the practical and ethical considerations involved in combining nano-medicine with conventional therapies.	CO3-App	(16)
14.	(a)	Describe the working mechanism of thermal nano-sensors and explain how they are utilized to monitor temperature variations in real-time medical applications. Also point out the key advantages of using thermal nano-sensors in healthcare.	CO1-U	(16)
		Or		
	(b)	Explain how real-time and in vivo medical monitoring is achieved using nano-sensor technology. Also point out the key benefits and challenges of using nano-sensors for continuous monitoring in clinical settings.	CO1-U	(16)
15.	(a)	(i) Explain the role of nano-devices in clinical nano-diagnostics.	CO1-U	(8)

	(ii)	Propose a surgical procedure using nano-robots to assist in organ transplantation. How would nano-robots help in reducing tissue rejection and improving post-surgery recovery?	CO3-App	(8)
		Or		
(b)	(i)	Explain how nanotubes are used for the detection of cancer proteins.	CO1-U	(8)
	(ii)	Develop a method for using gold nanoparticles to diagnose early-stage breast cancer. How would you ensure that gold nanoparticles target only cancerous cells, and what are the key steps in your method?	CO3-App	(8)