University of Mumbai

Question Bank

Program: **Electronics Engineering**
Curriculum Scheme: Rev2016
Examination: BE Semester VIII
Course Code: ELXDLO8042 and Course Name: MEMS Technology

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Objective Questions

1.	The ratio of Maximum deflection of cantilever beam to its ----------- is called stiffness of the beam.
Option A:	load
Option B:	slope
Option C:	span
Option D:	reaction at the support.
2.	Quartz is close to being an ideal material for sensors because of its
Option A:	more dimensional stability than silicon for high temperature.
Option B:	more dimensional stability than silicon for low temperature
Option C:	more flexibility than silicon for high temperature
Option D:	more flexibility than silicon for low temperature
3.	Gyroscopes are----------
Option A:	Internal sensors
Option B:	Pressure sensor
Option C:	Voltage sensor
Option D:	Humidity sensor
4.	Lorentz forces are useful for closed-loop feedback in systems employing -------- sensing.
Option A:	Magnetic
Option B:	Electromagnetic
Option C:	Piezoresistive
Option D:	Electrostatic
5.	------- is used to protect the remaining area of wafer while machining
Option A:	Tin foil
Option B:	Wood
Option C:	Sodium bicarbonate
Option D:	Photoresist layer
6.	Product after etching of Si wafer with KoH is-------- shape.
Option A:	Square
Option B:	Circular at the end
Option C:	Trapezoidal
Option D:	Oval
7.	Glass wafer to silicon wafer bonding can be done by:

Option A:	Plasma Bonding
Option B:	Anodic Bonding
Option C:	Using double sided adhesive
Option D:	Thermocompression
8.	Theory behind working of accelerometer can be understood from mechanical model of accelerometer, using ---------
Option A:	Rotary mechanism
Option B:	Linear mechanism
Option C:	Newtonian mechanism
Option D:	Reciprocating mechanism
9.	Usually an insulating layer of say SiO2, is deposited over microheater pattern. Why is this done?
Option A:	To reduce the temperature at the surface of the insulator where the heat will be used
Option B:	To provide uniform heating
Option C:	To stop the heat from spreading from the microheater layer to the surface
Option D:	To cool down suddenly when heating stops.
10.	In MEMS device Fracture Failure Mechanisms comes under which type?
Option A:	Degradation mechanisms
Option B:	Environmental failure mechanisms
Option C:	Operational failure mechanisms
Option D:	None of the above
11.	Which sensor is used in Air bag system in car?
Option A:	Accelerometer
Option B:	Gyro sensor
Option C:	Touch sensor
Option D:	Proximity sensor
12.	To deposit polymers which deposition method is used?
Option A:	CVD
Option B:	LPCVD
Option C:	HPCVD
Option D:	PECVD
13	Which statement is wrong for good reliability check?
Option A:	Wafer Dicing should be checked
Option B:	Thermal management should be checked
Option C:	Restorative functioning of the device
Option D:	Stress should be isolated properly.
14.	What is Sputtering?
Option A:	Process of Cleaning
Option B:	Process of Deposition
Option C:	Process of Diffusion
Option D:	Process of Oxidation

15.	Direct conversion of temperature differences to electric voltage and vice versa is called as_____________.
Option A:	Piezo electricity
Option B:	Piezo resistivity
Option C:	Thermomagnetic
Option D:	Thermoelectricity
16.	In Microvalve application which actuation technique is used
Option A:	Thermal
Option B:	Piezoelectric
Option C:	Lorentz force actuation
Option D:	Capacitive
17.	Cantilever beam is formed by which micromachining technique?
Option A:	Surface micromachining
Option B:	Bulk micromachining
Option C:	polysilicon micromachining
Option D:	Crystalline micromachining
18.	The principal microfabrication process used in bulk manufacturing is
Option A:	Etching
Option B:	chemical vapour deposition
Option C:	physical vapour deposition
Option D:	Diffusion
19.	Find the size of the mask opening that after an-isotropic (tan 54.74^{0})etching will yield a flat rectangular area of size 100µm by 200 µm and 80µm below the silicon .
Option A:	100 µm ,80 µm
Option B:	100 µm, 200 µm
Option C:	213.2 µm , 313.2 µm
Option D:	113 µm,203 µm
20.	You need to calculate pressure without any input voltage. Which of the following materials could be used as a sensing element in the pressure sensor?
Option A:	Piezo Resistive
Option B:	Piezo Electric
Option C:	Capacitive pressure sensor
Option D:	Inductive pressure sensor

Subjective Questions

1	Explain the role of MEMS sensors in IOT.
2	Define TCR, Thermal conductivity and its significance with respect to MEMS devices.
3	Explain various micro-actuation techniques pertaining to MEMS technology
4	Explain DRIE in detail.
5	Explain principle of Digital Mirror Device
6	List different types of failure mechanisms and explain any one in detail.
7	What are polymers? Discuss role of SUB and PMMA polymers in MEMS

	applications.
8	Differentiate between surface and bulk micromachining for fabrication of MEMS devices with suitable example.
9	Describe the representative process flow for fabricating the micro-heater. Also explain the operating principle of this MEMS device in detail with its analytical expression.
10	Explain with a block diagram the components of a microsystem.
11	Draw schematic diagram and explain the operation of Micropump.
12	List the different types of wafer bonding and explain in detail the anodic Wafer Bonding with diagram.
13	Explain in detail fabrication of surface micro machined pressure sensors using poly silicon piezo resistors and explain its working principle with diagram.
14	Define reliability? Draw and explain bath-tub-curve, describing MEMS devices reliability.
15	What are polymers? Discuss the Role of any one polymer in MEMS fabrication.
16	Explain air bag deployment system in brief.
17	Differentiate between bulk and surface micro machining.
18	What is the stiffness constant of microcantilever beam for following given dimensions and a point contact load applied at its tip. E=170GPa, h(thickness)=10um, w(width)= 1um and L(length)=50um.
19	Define the term TCR. Also describe the method of characterization of TCR.
20	Explain process integration of a typical MEMS device.
21	Discuss selection of material based on application and explain silicon use as ideal substrate material in MEMS. Also Explain role of, three silicon compound material used in MEMS.
22	What do you mean by wafer bonding? Explain with neat diagram, different wafer bonding techniques.
23	Explain anyone MEMS device used in modern automobile system with working principle and representative fabrication process steps.
24	Write short notes Applications of MEMS in Biomedical Instrumentation.
25	Explain in details MEMS packaging and its challenges.
26	What are micro-actuators pertaining to MEMS Technology? Give two examples.
27	Give two examples of combination of structural, sacrificial layers and etchants used in MEMS fabrication along with their applications
28	List and explain all the types of failure mechanisms used in MEMS