



# Final Assessment

## Participant Guide

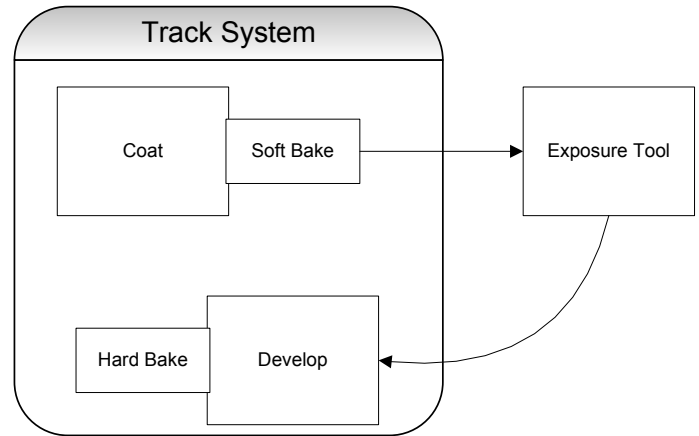
### Introduction

The purpose of this assessment is to determine your understanding of MEMS, MEMS applications, fabrications, packaging and design after viewing the film MEMS: Making Micro Machines and completing its three related activities. This assessment consists of several fill-in-the-blank and short answer questions.

There are twenty (20) assessment questions.

1. What are Microelectromechanical systems (MEMS)?
2. A \_\_\_\_\_ is an inertial sensor that senses rotational motion.
3. MEMS components that move other MEMS components by forces such as electrostatic or mechanical are called \_\_\_\_\_.
4. Briefly describe two different types of MEMS.
5. What type of MEMS is used in airbag deployment systems in automobiles?
6. Name three applications of MEMS pressure sensors.

7. What fabrication process is illustrated in the following diagram?
- \_\_\_\_\_



8. Refer to the diagram in the previous question. Which block (step) of this process uses UV light and a patterned mask? \_\_\_\_\_
9. Refer to the above diagram. What is the light sensitive material that is applied to the wafer during the coat process? \_\_\_\_\_
10. In a digital mirror display (DMD), each micromirror reflects a \_\_\_\_\_ of light during operation.
11. In a digital mirror display (DMD), the mirrors move to an ON position when \_\_\_\_\_ is applied to the electrodes fabricated below the mirrors.
12. In the fabrication of a DMD array, silicon dioxide (oxide) layers are used as a \_\_\_\_\_ to protect the sections of the yoke during fabrication and to provide a patterned layer for etching the aluminum layer that forms the mirrors.
13. In the fabrication of DMDs, layers of photoresist are applied above and below the aluminum layer that forms the mirrors and posts. These photoresist layers are later removed in the packaging process. What are the purposes of these photoresist layers?
- a. The resist layer below the aluminum is \_\_\_\_\_
- \_\_\_\_\_
- b. The resist layer above the aluminum is \_\_\_\_\_
- \_\_\_\_\_

14. During packaging of DMDs, \_\_\_\_\_ is applied around the edges of the DMD dies as a glue to connect DMD chips to the protective windows. The glued wafer and windows are then transfer to the \_\_\_\_\_ chamber which hermetically seals the MEMS structures.
15. A wet anisotropic etch process using KOH (potassium hydroxide) is used to etch silicon crystal substrate to form the microchannels used in inkjet print heads. A removal process that etches into the silicon crystal or substrate is called a \_\_\_\_\_ etch process.
16. The deep reactive ion etch (DRIE) process uses the Bosch process to develop tall structures and deep trench with high \_\_\_\_\_ ratios.
17. Mechanical designers determine the limitation of the mechanical \_\_\_\_\_, the components that convert motion into an electrical signal.
18. State two tasks that could be performed during the partitioning and model generation step of the design process?
19. The steps of the design process are repeated over and over again before an acceptable model is developed.
  - a. True
  - b. False
20. Now that you have learned about MEMS, MEMS applications, fabrication, packaging and design, what excites you? What part of the process do you find most interesting and why?

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