

DFMA Question Bank

Section A – 2 Marks Questions (10 Questions)

1. What is DFMA?

Answer: DFMA (Design for Manufacturing and Assembly) is a methodology that simplifies product design by reducing manufacturing complexity and assembly time, leading to cost savings and improved efficiency.

2. Mention two key objectives of DFMA.

Answer:

1. **Reduce manufacturing and assembly costs.**
2. **Improve product quality and reliability.**

3. What are the two components of DFMA?

Answer:

1. **Design for Manufacturing (DFM)** – Focuses on optimizing design for easy and cost-effective manufacturing.
2. **Design for Assembly (DFA)** – Focuses on reducing assembly complexity and improving efficiency.

4. List the phases of design in product development.

Answer:

1. Conceptual Design
2. Embodiment Design
3. Detailed Design
4. Prototype & Testing
5. Production

5. How does material selection affect the design process?

Answer: The choice of material impacts **weight, cost, manufacturability, durability, and environmental impact** of the product.

6. Name two guidelines for Design for Assembly (DFA).

Answer:

1. **Minimize part count** to reduce complexity.
2. **Use self-aligning and self-locating features** for easy assembly.

7. What is the significance of Design for Additive Manufacturing (DfAM)?

Answer: DfAM optimizes designs for **3D printing**, enabling **complex geometries, material efficiency, and reduced assembly needs**.

8. Define Computer-Aided DFMA.

Answer: Computer-aided DFMA uses **software tools** to analyze product designs for **manufacturability and assembly efficiency**, providing cost estimates and design improvements.

9. What is the role of DFMA in sustainable design?

Answer: DFMA reduces **material waste, energy consumption, and environmental impact** by optimizing design and manufacturing processes.

10. How does reducing fasteners improve DFMA?

Answer: Fewer fasteners **reduce assembly time, cost, and potential failure points**, improving product reliability.

Section B – 13 Marks Questions (5 Questions)

1. Explain the importance of DFMA in product development.

Answer:

- DFMA enhances **cost-effectiveness** by simplifying the **manufacturing and assembly processes**.
 - Reducing part count minimizes **material and labor costs**.
 - Streamlined assembly reduces **production time** and **defects**.
 - DFMA aids in **early-stage design improvements**, avoiding costly design changes later.
 - It facilitates **automation**, improving consistency and efficiency.
 - DFMA supports **sustainable manufacturing** by reducing waste.
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2. Discuss the phases of design and their impact on DFMA.

Answer:

1. **Conceptual Design:** Defines product **functionality, feasibility, and manufacturability**.
 2. **Embodiment Design:** Selects **materials, processes, and configurations** to optimize assembly.
 3. **Detailed Design:** Implements **tolerances, dimensions, and manufacturing constraints**.
 4. **Prototype & Testing:** Evaluates manufacturability, assembly sequence, and design flaws.
 5. **Production:** Ensures **efficient mass production** with minimal cost and defects.
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3. Describe the general requirements for material and process selection in DFMA.

Answer:

- **Material Properties:** Must consider **strength, weight, corrosion resistance, machinability, and recyclability**.

- **Manufacturing Processes:** Selected based on **cost, precision, and scalability**.
 - **Design Complexity:** Simpler designs reduce **processing steps and defects**.
 - **Standardization:** Using **standard materials and parts** reduces **cost and procurement time**.
 - **Sustainability:** Choosing **eco-friendly materials and processes** supports **green manufacturing**.
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4. Explain key DFA guidelines with examples.

Answer:

1. **Minimize Part Count:** Fewer parts reduce **assembly time and cost** (e.g., snap-fit instead of screws).
 2. **Use Modular Design:** Enables **easy upgrades and repairs** (e.g., modular PC components).
 3. **Ensure Easy Handling:** Parts should be **easy to grip and orient** (e.g., rounded edges for automated pick-and-place).
 4. **Self-Locating Features:** Helps in **alignment without additional tools** (e.g., locating pins in automotive assemblies).
 5. **Reduce Fasteners:** Use **welds, clips, and press-fits** instead of bolts.
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5. Discuss the role of DFMA in Additive Manufacturing and Environmentally Conscious Design.

Answer:

A. DFMA in Additive Manufacturing (DfAM):

- Enables **complex and lightweight geometries**.
- Reduces **material wastage** (only necessary material is used).
- Eliminates the need for **multiple components** (e.g., single-part aerospace brackets).

B. DFMA in Environmentally Conscious Design:

- **Material Optimization:** Reduces material usage and supports **recyclable materials**.
- **Energy Efficiency:** Optimized designs **lower power consumption** during production.
- **Waste Reduction:** Minimizes scrap and excess processing steps.
- **Sustainable End-of-Life Design:** Designs for **reuse, remanufacturing, or recycling**.