AUTODESK
Certification

EXAM OBJECTIVES

Autodesk Certified: Mechanical Engineer in Design and Manufacturing

The Autodesk Certification for a Mechanical Engineer in Design and Manufacturing is a role-based certification intended for design and manufacturing industry professionals who possess advanced skillsets, mindsets, and toolsets and can solve complex challenges in workflow and design. This Autodesk certification is an industry recognized credential for users who have mastered the mechanical engineering skills covered in this exam. This type of experience typically comes from progressive development of skills and responsibilities in the Mechanical Engineering multidiscipline design environment over at least 3 years. Candidates who obtain this certification demonstrate expertise in Mechanical Engineering and stand out in a competitive professional environment. This exam covers common skills across a wide range of industries from aeronautical, defense, automotive, construction, and transport engineering to manufacturing, medical, energy and telecommunications engineering.

Prerequisites

It is expected that you will have a general understanding of:

- Understand basic material properties.
- Understand basic mechanical engineer formulas and how to apply them.
- Have Autodesk software experience.
- Have good computer skills.
- Have experience creating and interpreting engineering drawings and specifications.
- Understand Geometric Dimensioning and Tolerancing (GD&T) and how to apply it.

The topics and features of the Autodesk software that may be covered in the exam are listed below each objective.

Note: Within the context of this exam, all references to "create, select, manage, etc." indicate "know how to create, select, manage, etc."

1. Concept / Requirement Generation

1.1 Given a design intent, determine the project criteria

1.1.a Determine the conditions and/or parameters that are needed to complete the design process

i. May include weight, strength, environment, productivity, sizing, loads, fastener size/count, life limits, file formats, measurement units, deliverables, timeframe, etc.

1.1.b Meet with manufacturing to define manufacturing requirements

i. May include available tooling, equipment, materials, staffing, etc.

ii. May include knowing to ask the following questions: Do we have the tooling and equipment to produce the product? Are the materials needed to produce the product readily available? Do we have the appropriately trained staff in place?

1.1.c Understand the principles associated with cost analysis, budget and road mapping.

i. May include the ability to read and understand a Gantt chart or cost analysis.

1.2 Given design criteria, map features to criteria

1.2.a Determine the design elements that meet functional requirements

1.2.b Determine how the design elements interact within the assembly or systems

i. May include functionality and space.

2. Design

2.1 Given a design intent, determine the appropriate modeling techniques to maximize efficiency and reusability

2.1.a Determine the most efficient modeling techniques

i. May include parametric modeling; or top down versus bottom up design.

2.1.b Understand the importance of good modeling practices

2.1.c Compare and contrast modeling techniques

i. May include surface modeling, solid modeling, or mesh; and knowing when to use one over the other.

2.2 Design to meet lifecycle requirements

2.2.a Create a design to meet assembly and maintenance access specifications

2.2.b Create a design to meet sustainability specifications

2.2.c Create a design to meet manufacturing specifications

2.2.d Create a design to meet product lifecycle specifications

2.3 Design to meet assembly requirements

2.3.a Create a design to be assembled with the appropriate techniques

i. May include welds and fasteners.

2.3.b Create a design that can be assembled with appropriate design tolerance stack-up requirements for fit and finish

2.3.c Create a design that can be assembled with appropriate mechanical connection requirements

i. May include cross part interference and hole alignment; understanding when to use and apply the techniques using applicable software.

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2.4 Prepare a CAD model for manufacturing processes

2.4.a Prepare a CAD model for CAM processes

i. May include using the appropriate tools for specific materials; understanding the basics of Speed and Feed rates and the effect they have; and being able to draw/model a machinable part.

2.4.b Prepare a CAD model for burn table/nesting/flat pattern

i. May include understanding how you situate parts to get the most efficient cuts.

2.4.c Prepare a CAD model for molding and casting

3. Finite Element Analysis (FEA)

3.1 Given a scenario, determine the appropriate analysis type for digital validation

i. May include material, geometry, type of analysis (linear), and load conditions.

3.2 Explain the importance of digital representations of loads and constraints

i. May include understanding fixtures and contacts (linear).

ii. May include focus on linear dependency, limited degrees of freedom, no penetration, and bonded.

3.3 Understand the need and use of meshing

3.3.a Identify meshing element definitions and controls

i. May include being able to identify the types of elements and how many nodes per element.

ii. May include understanding what is used to determine the quality of mesh; understanding types of elements; knowing what aspect ratio is (Jacobian, etc.); and knowing if and why a mesh is required.

3.4 Interpret and utilize FEA output

3.4.a Given a contour plot and specifications, interpret the results of a Finite Element Analysis.

i. May include reviewing a model with the contour results and being able to give the material information and determining whether the part meets the given specifications.

3.4.b Understand the use cases and limitations of FEA

i. May include being able to determine where the design is at, if it meets the specific design need, the quality of mesh, the quality of the material model, and if the output is in direct relation to your input.

4. Documentation

4.1 Validate a part or assembly matches the design criteria

4.1.a Create and interpret standard drawing views

i. May include being able to determine what views are necessary to fully define the geometry of a part; orthogonal, detail, section, isometric, auxiliary, and exploded.

4.1.b Apply the appropriate dimensions according to standards

i. May include ANSI, ISO, etc.

4.2 Determine necessary Geometric Design and Tolerances (GD&T)

4.2.a Understand the principles of GD&T

i. May include understanding what tolerances are and why they are important; and applying and communicating tolerances.

4.2.b Recognize the effects of part tolerance stack-ups on a given assembly.

4.2.c Understand how different manufacturing processes produce different tolerances

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4.2.d Identify basic symbols

i. May include welding, flatness, cylindricity, and parallelism.

4.3 Understand the purpose of Product Lifecycle Management

4.3.a Comprehend the basic principles and importance of lifecycle and revision control

i. May include understanding the difference between a version and a revision.

4.3.b Create a bill of materials (BOM)

4.3.c Identify data-exchange file types

i. May include .step, .iges, .dxf, .stl, and point cloud files; understand the difference between .step and .iges; understanding the difference between static solid versus feature-based model; and understanding that files are application-agnostic.

4.4 Demonstrate a working knowledge of 3D Model Based Definition (MBD)

4.4.a Understand the advantages and limitations of MBD

5. Manufacturing

5.1 Given a desired outcome, determine when to custom manufacture a part or purchase a ready-made part

5.1.a Given a model, determine the correct manufacturing process based on cost, quantity, material, tolerance requirements, etc.

5.2 Verify that a component is ready for a specified manufacturing process

5.2.a Understand basic subtractive machining processes

i. May include feeds and speeds, tool paths and corner radii.

5.2.b Understand the principles of molding and casting processes

i. May include parting lines and draft angles.

5.2.c Understand the principles of the sheet metal forming process

i. May include bend relief.

5.2.d Understand the principles of additive manufacturing

5.3 Understand the cost benefits of various manufacturing processes

5.3.a Identify major factors that drive cost (volume, material, manufacturing process, time)

i. May include design time, manufacturing, assembly, and PM; and how volume affects the cost / viability of a part for different technologies.

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