

Table of Contents

Dedication	iii
Preface	xv

Chapter 1: Introduction to CATIA V5

Introduction to CATIA V5R20	1-2
CATIA V5 Workbenches	1-2
System Requirements	1-4
Getting Started with CATIA V5R20	1-4
Important Terms and Definitions	1-5
Understanding the Functions of Mouse Buttons	1-12
Toolbars	1-13
Hot Keys	1-24
Color Scheme	1-25

Chapter 2: Drawing Sketches in the Sketcher Workbench-I

The Sketcher Workbench	2-2
Starting a New File	2-2
Invoking the Sketcher Workbench	2-4
Invoking the Sketcher Workbench Using the Sketch Tool	2-4
Invoking the Sketcher Workbench Using the Positioned Sketch Tool	2-5
Setting the Sketcher Workbench	2-5
Modifying Units	2-6
Modifying Grid Settings	2-6
Understanding Sketcher Terms	2-7
Specification Tree	2-7
Grid	2-9
Snap to Point	2-9
Construction/Standard Element	2-9
Select Toolbar	2-9
Inferencing Lines	2-11
Drawing Sketches Using Sketcher Tools	2-11
Drawing Lines	2-12
Drawing Center Lines	2-15
Drawing Rectangles, Oriented Rectangles, and Parallelograms	2-15
Drawing Rectangles	2-16
Creating Points	2-18
Drawing Circles	2-18
Drawing Arcs	2-20
Drawing Profiles	2-22

Drawing Display Tools	2-24
Fit All In	2-24
Pan	2-25
Zoom In	2-25
Zoom Out	2-25
Zoom Area	2-25
Normal View	2-26
Splitting the Drawing Area into Multiple Viewports	2-26
Hiding and Showing Geometric Elements	2-26
Swapping Visible Space	2-26
Tutorial 1	2-27
Tutorial 2	2-31
Tutorial 3	2-34
Tutorial 4	2-39
Self-Evaluation Test	2-43
Review Questions	2-44
Exercise 1	2-45
Exercise 2	2-46

Chapter 3: Drawing Sketches in the Sketcher Workbench-II

Other Sketching Tools in the Sketcher Workbench	3-2
Drawing Ellipses	3-2
Drawing Splines	3-3
Connecting Two Elements by a Spline or an Arc	3-4
Drawing Elongated Holes	3-5
Drawing Cylindrical Elongated Holes	3-6
Drawing Keyhole Profiles	3-6
Drawing Hexagons	3-7
Drawing Centered Rectangles	3-7
Drawing Centered Parallelograms	3-8
Drawing Conics	3-9
Editing and Modifying Sketches	3-11
Trimming Unwanted Sketched Elements	3-12
Extending Sketched Elements	3-13
Trimming by Using the Quick Trim Tool	3-13
Filleting Sketched Elements	3-14
Chamfering Sketched Elements	3-15
Mirroring Sketched Elements	3-16
Mirroring Elements without Duplication	3-17
Translating Sketched Elements	3-17
Rotating Sketched Elements	3-18
Scaling Sketched Elements	3-19
Offsetting Sketched Elements	3-19
Modifying Sketched Elements	3-20
Deleting Sketched Elements	3-23
Tutorial 1	3-23
Tutorial 2	3-28

Tutorial 3	3-32
Self-Evaluation Test	3-35
Review Questions	3-36
Exercise 1	3-37
Exercise 2	3-38

Chapter 4: Constraining Sketches and Creating Base Features

Constraining Sketches	4-2
Concept of Constrained Sketches	4-2
Iso-Constraint	4-2
Under-Constraint	4-2
Over-Constrained	4-3
Inconsistent	4-3
Not Changed	4-3
Applying Geometrical Constraints	4-3
Applying Geometrical Constraints Automatically	4-3
Applying Additional Constraints to the Sketch	4-4
Applying Dimensional Constraints	4-7
Applying Contact Constraints	4-11
Applying Fix Together Constraints	4-12
Applying Auto Constraints	4-13
Editing Multiple Dimensions	4-14
Analyzing and Deleting Over-Defined Constraints	4-15
Exiting the Sketcher Workbench	4-15
Creating Base Features by Extrusion	4-15
Creating a Thin Extruded Feature	4-17
Extruding the Sketch Using the Profile Definition Dialog Box	4-18
Extruding the Sketch along a Directional Reference	4-19
Creating Base Features By Revolving Sketches	4-20
Creating Thin Shaft Features	4-22
Dynamically Rotating the View of the Model	4-22
Rotating the View Using the Rotate Tool	4-22
Rotating the View Using the Compass	4-23
Modifying the View Orientation	4-24
Display Modes of the Model	4-25
Shading (SHD)	4-25
Shading with Edges	4-25
Shading with Edges without Smooth Edges	4-25
Shading with Edges and Hidden Edges	4-25
Shading with Material	4-26
Wireframe (NHR)	4-26
Customize View Parameters	4-26
Creating Sections Dynamically New	4-26
Maneuvering the Section Plane	4-26
Position of Section Planes	4-27
Assigning a Material to the Model	4-28
Tutorial 1	4-29

Tutorial 2	4-35
Self-Evaluation Test	4-41
Review Questions	4-42
Exercise 1	4-43
Exercise 2	4-43

Chapter 5: Reference Elements and Sketch-Based Features

Importance of Sketching Planes	5-2
Reference Elements	5-3
Reference Planes	5-3
Creating New Planes	5-4
Creating Points	5-9
Creating Reference Lines	5-10
Other Sketch-Based Features	5-11
Creating Drafted Filleted Pad Features	5-11
Creating Multi-Pad Features	5-11
Feature Termination Options	5-13
Creating Pocket Features	5-14
Creating Drafted Filleted Pocket Features	5-15
Creating Multi-Pocket Features	5-15
Creating Groove Features	5-16
Extruding and Revolving Planar and Nonplanar Faces	5-17
Projecting 3D Elements	5-18
Tutorial 1	5-19
Tutorial 2	5-23
Tutorial 3	5-26
Self-Evaluation Test	5-32
Review Questions	5-33
Exercise 1	5-34
Exercise 2	5-35
Exercise 3	5-36

Chapter 6: Creating Dress-Up and Hole Features

Advanced Modeling Tools	6-2
Creating Hole Features	6-2
Creating Fillets <i>Enhanced</i>	6-10
Creating Chamfers	6-21
Adding a Draft to the Faces of the Model	6-23
Creating a Shell Feature	6-28
Tutorial 1	6-30
Tutorial 2	6-36
Self-Evaluation Test	6-42
Review Questions	6-43
Exercise 1	6-44
Exercise 2	6-45

Chapter 7: Editing Features

Editing Features of a Model	7-2
Editing Using the Definition Option	7-2
Editing by Double-Clicking	7-3
Editing the Sketch of a Sketch-Based Feature	7-3
Redefining the Sketch Plane of Sketches	7-3
Deleting Unwanted Features	7-4
Managing Features and Sketches by using the Cut, Copy, and Paste Functionalities	7-5
Understanding the Concept of Update Diagnosis	7-6
Cut, Copy, and Paste Features and Sketches	7-7
Copying Features Using Drag and Drop	7-7
Copying and Pasting PartBodies	7-8
Deactivating Features	7-9
Activating Deactivated Features	7-10
Defining Features in Work Object	7-10
Reordering Features	7-10
Understanding the Parent-Child Relationships	7-12
Measuring Elements	7-12
Measuring between Elements	7-12
Measuring Items	7-14
Measuring Inertia	7-14
Tutorial 1	7-16
Tutorial 2	7-21
Tutorial 3	7-26
Self-Evaluation Test	7-31
Review Questions	7-31
Exercise 1	7-32
Exercise 2	7-33

Chapter 8: Transformation Features and Advanced Modeling Tools-I

Transformation Features	8-2
Translating Bodies	8-2
Rotating Bodies	8-3
Creating Symmetry Features	8-5
Transforming the Axis System	8-5
Mirroring Features and Bodies	8-6
Creating Rectangular Patterns	8-8
Creating Circular Patterns	8-13
Creating User Patterns	8-16
Uniform Scaling of Model	8-17
Non-uniform Scaling of Model	8-18
Working With Additional Bodies	8-18
Inserting a New Body	8-19
Inserting Features in the New Body	8-19
Applying Boolean Operations to Bodies	8-19

Adding Stiffeners to a Model	8-25
Generating Solid Combine	8-27
Tutorial 1	8-28
Tutorial 2	8-34
Self-Evaluation Test	8-38
Review Questions	8-38
Exercise 1	8-39

Chapter 9: Advanced Modeling Tools-II

Advanced Modeling Tools	9-2
Creating Rib Features	9-2
Creating Slot Features	9-7
Creating Multi-Sections Solid Features	9-8
Creating Removed Multi-Sections Solid Features	9-16
Tutorial 1	9-17
Tutorial 2	9-22
Tutorial 3	9-28
Self-Evaluation Test	9-33
Review Questions	9-34
Exercise 1	9-35
Exercise 2	9-35

Chapter 10: Working with the Wireframe and Surface Design Workbench

Need of Surface Modeling	10-2
Wireframe and Surface Design Workbench	10-2
Starting the Wireframe and Surface Design Workbench	10-2
Creating Wireframe Elements	10-2
Creating Circles	10-2
Creating Splines	10-3
Creating a Helix	10-4
Creating Surfaces	10-6
Creating Extruded Surfaces	10-7
Creating Revolved Surfaces	10-8
Creating Spherical Surfaces	10-9
Creating Cylindrical Surfaces	10-9
Creating Offset Surfaces	10-10
Creating Sweep Surfaces	10-11
Creating Fill Surfaces	10-16
Creating Multi-Sections Surfaces	10-17
Creating Blended Surfaces	10-18
Operations on Shape Geometry	10-19
Joining Surfaces	10-19
Splitting Surfaces	10-20
Trimming Surfaces	10-21
Tutorial 1	10-22
Tutorial 2	10-28

Self-Evaluation Test	10-37
Exercise 1	10-38
Exercise 2	10-39

Chapter 11: Editing and Modifying Surfaces

Surface Operations	11-2
Creating Projection Curves	11-2
Creating Intersection Elements	11-3
Healing Geometries	11-5
Disassembling Elements	11-6
Untrimming a Surface or a Curve	11-6
Creating Boundary Curves	11-7
Extracting Geometry	11-9
Transformation Features	11-10
Extrapolating Surfaces and Curves	11-16
Splitting a Solid Body with a Surface	11-17
Solidifying Surface Models	11-18
Adding Thickness to a Surface	11-18
Creating a Solid Body from a Closed Surface Body	11-19
Sewing a Surface to a Solid Body	11-20
Tutorial 1	11-21
Tutorial 2	11-29
Self-Evaluation Test	11-36
Review Questions	11-36
Exercise 1	11-37

Chapter 12: Assembly Modeling

Assembly Modeling	12-2
Types of Assembly Design Approaches	12-2
Creating Bottom-up Assemblies	12-3
Inserting Components in a Product File	12-4
Moving Individual Components	12-6
Applying Constraints	12-12
Creating Top-down Assemblies	12-22
Creating Base Part in the Top-Down Assembly	12-22
Creating Subsequent Components in the Top-Down Assembly	12-23
Creating Subassemblies in the Top-Down Assembly	12-24
Editing Assemblies	12-25
Deleting Components	12-25
Replacing Components	12-26
Editing Components Inside an Assembly	12-27
Editing Subassemblies Inside an Assembly	12-27
Editing Assembly Constraints	12-28
Simplifying the Assembly	12-29
Interference Detection	12-30
Sectioning an Assembly	12-32

Exploding an Assembly	12-33
Tutorial 1	12-36
Tutorial 2	12-49
Self-evaluation Test	12-56
Review Questions	12-57
Exercise 1	12-58

Chapter 13: Working with the Drafting Workbench-I

The Drafting Workbench	13-2
Starting a New File in the Drafting Workbench	13-2
Type of Views	13-4
Generating Drawing Views	13-6
Generating Views Automatically	13-6
Generating Individual Drawing Views	13-10
Generating the Exploded View	13-24
Working with Interactive Drafting in CATIA V5	13-25
Editing and Modifying Drawing Views	13-25
Changing the Scale of Drawing Views	13-25
Modifying the Project Plane of the Parent View	13-25
Deleting Drawing Views	13-26
Rotating Drawing Views	13-26
Hiding Drawing Views	13-26
Modifying the Hatch Pattern of Section Views	13-26
Tutorial 1	13-27
Tutorial 2	13-33
Self-Evaluation Test	13-40
Review Questions	13-41
Exercise 1	13-42

Chapter 14: Working with the Drafting Workbench-II

Inserting Sheets in the Current File	14-2
Inserting the Frame and the Title Block	14-3
Automatic Insertion of the Frame and the Title Block	14-3
Creating the Frame and the Title Block Manually	14-5
Adding Annotations to the Drawing Views	14-7
Generating Dimensions	14-7
Creating Reference Dimensions	14-10
Adding Datum Features	14-12
Adding Geometric Tolerance to the Drawing Views	14-13
Adding Surface Finish Symbols	14-14
Adding Welding Symbols	14-15
Applying Weld	14-17
Editing Annotations	14-17
Generating the Bill of Material (BOM)	14-17
Generating Balloons	14-19
Tutorial 1	14-20

Tutorial 2	14-28
Self-Evaluation Test	14-32
Review Questions	14-33
Exercise 1	14-34

Chapter 15: Working with Sheet Metal Components

The Sheet metal Component	15-2
Starting a New File in Generative Sheet Metal Workbench	15-2
Setting Sheet Metal Parameters	15-3
Parameters Tab	15-3
Bend Extremities Tab	15-4
Bend Allowance Tab	15-6
Introduction to Sheet Metal Walls	15-6
Creating the Base Wall	15-6
Creating the Wall On Edge <i>Enhanced</i>	15-7
Creating Extrusions	15-12
Creating Swept Walls	15-14
Creating Flanges on the Sheet Metal Component	15-14
Creating Hems on the Sheet Metal Component	15-17
Creating a Tear Drop on the Sheet Metal Component	15-17
Creating a User Flange on the Sheet Metal Component	15-18
Creating a Bend	15-19
Creating a Conical Bend	15-20
Bend From Flat <i>Enhanced</i>	15-21
Folding and Unfolding Sheet Metal Parts	15-24
Unfolding Sheet Metal Parts	15-24
Folding Unfolded Parts	15-25
Mapping the Geometry	15-26
Creating Flat Patterns of Sheet Metal Components	15-27
Viewing a Sheet Metal Component in Multiple Windows	15-28
Using Views Management	15-28
Stamping	15-28
Creating a Surface Stamp	15-29
Creating a Bead Stamp	15-32
Creating a Curve Stamp	15-33
Creating a Flanged Cut Out Stamp	15-35
Creating a Louver Stamp	15-36
Creating a Bridge Stamp	15-37
Creating a Flanged Hole Stamp	15-39
Creating a Circular Stamp	15-40
Creating a Stiffening Rib Stamp	15-41
Creating a Dowel Stamp	15-42
Tutorial 1	15-43
Tutorial 2	15-49
Tutorial 3	15-54
Tutorial 4	15-58
Self-Evaluation Test	15-64

Review Questions	15-64
Exercise 1	15-65

Chapter 16: DMU Kinematics

Introduction to DMU Kinematics	16-2
Designing a Mechanism	16-2
Creating the Revolute Joint	16-3
Creating the Prismatic Joint	16-8
Creating the Cylindrical Joint	16-9
Creating the Screw Joint	16-10
Creating the Rigid Joint	16-12
Creating the Spherical Joint	16-12
Creating the Planar Joint	16-15
Creating the Point Curve Joint	16-16
Creating the Slide Curve Joint	16-17
Creating the Roll Curve Joint	16-18
Creating the Point Surface Joint	16-19
Creating the Universal Joint	16-20
Creating the CV Joint	16-21
Creating the Gear Joint	16-22
Creating the Rack Joint	16-24
Creating the Cable Joint	16-26
Converting Assembly Constraints into Joints	16-27
Tutorial 1	16-28
Tutorial 2	16-34
Tutorial 3	16-39
Tutorial 4	16-46
Tutorial 5	16-50
Self-Evaluation Test	16-56
Review Questions	16-56
Exercise 1	16-57
Exercise 2	16-57