

This final exam is based on 2 parts. Part 1 consists of a set of questions and represents a total of 10 points. Part 2 is an application case and represents 10 points. As a reminder, the use of English language for answering is needed.

Part 1: Questions (10 pts)

1. Give the definition of PLM. (1 pt)
2. Define PDM and MPM, and their role in the PLM strategy. (1 pt)
3. What are the main stakes of PLM in engineering design? (1 pt)
4. What are the main functionalities of a PLM system? (1 pt)
5. What are the key features (mechanisms) enabling collaboration between design engineers and process engineers? (1 pt)
6. Describe briefly a engineering change management (ECM) process. (1 pt)
7. What are the differences between “bottom-up” and “top-down” modelling approaches in geometric modelling phase? (1 pt)
8. Explain an emergent geometric modelling approach which promotes collaborative and top-down modelling in the extended enterprise context. List the advantages of such an approach. (1 pt)
9. Give the definition of SLM and its main issues. (1 pt)
10. What does DFA mean? Give at least 5 DFA rules among the 20 DFA guidelines. (1 pt)

Part 2: Skeleton-based modelling and Assembly Sequence Planning (10 pts)

By considering the following case study (See Figure 1), you have to firstly define the final skeleton-based model. This model will be assembly-oriented (skeletons structure and assembly relationships). It is requested to develop this model in a step-by-step way. As appendix, Tables 1 and 2 have been introduced in order to provide guidelines. In addition, the definition of an appropriate assembly sequence of the case study is also requested.

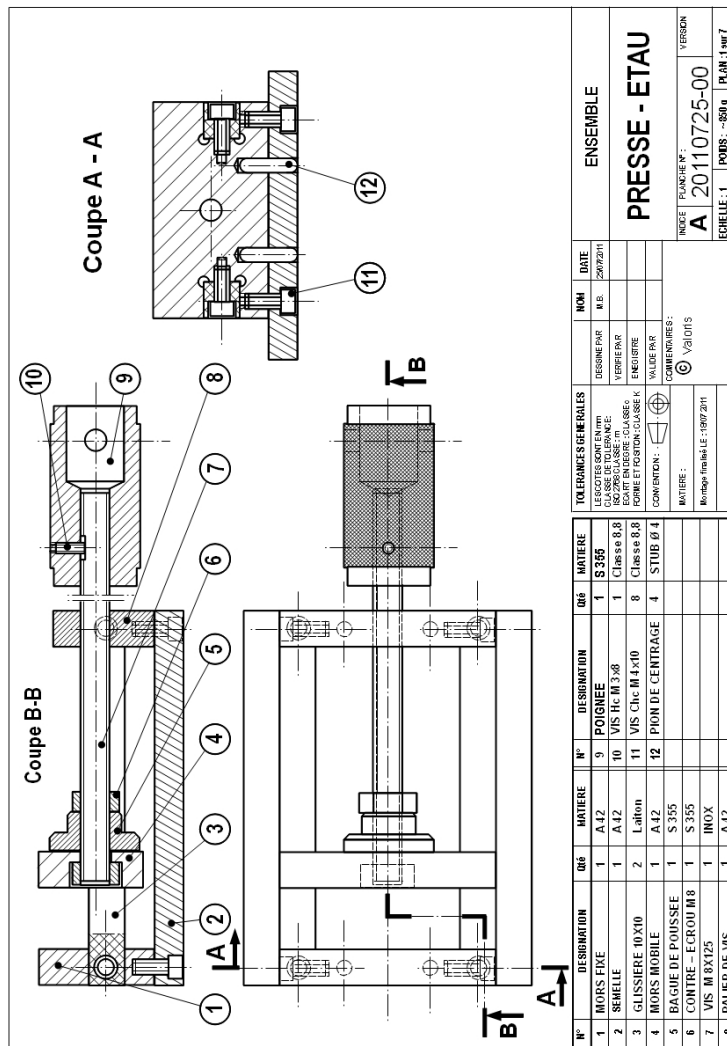


Figure 1: Mechanical assembly as a case study for Part 2.

Table 1
 Skeleton entities definition based on kinematic pairs.

Kinematic pair	Constraint	Assembly skeleton	
		Entity	Assembly axis
Rigid	Coordinate system/coordinate system	Coordinate system	Any
Revolute	Axis-axis and Plane-plane	Line, Plane	Rotation axis
Prismatic	Axis-axis and Plane-plane	Line, plane	Translation axis
Screw	Axis-axis and Plane-plane	Line, plane	Rotation axis
Cylindrical	Axis-axis	Line	Translation/rotation axis
Spherical	Point-point	Point	Any
Planar	Plane-plane	Plane	Perpendicular to the plane
Point-contact	Point-plane	Point, plane	Perpendicular to the plane
Line-contact	Line-plane	Line, plane	Perpendicular angle
Curve-contact	Curve-curve	Curve	Translation axis

Table 2
 Skeleton entities definition based on technological pairs.

Technological pair	Constraint	Assembly skeleton		Assembly axis
		Entity	Constraint	
Gluing	Coordinate system/coordinate system	Coordinate system	/	Any
Welding	Coordinate system/coordinate system	Coordinate system	/	Any
Screwing	Axis-axis and plane-plane	Line, plane	Perpendicular	Rotation axis
Riveting	Axis-axis and plane-plane	Line, plane	Perpendicular	Rotation Axis
Cotter	Axis-axis and plane-plane	Line, plane	Perpendicular	Translation axis
Pin	Axis-axis and plane-plane	Line, plane	Perpendicular	Rotation axis
Gear-rack	Curve-curve	Lines, curve	Distance	Rotation axis
Gear-gear	Axis-axis and curve-curve	Lines, curve	Distance	Rotation axis