Université de Technologie de Belfort-Montbéliard – UTBM
Mechanical Engineering and Design Department – GMC
CP51 Class: PLM and design for X
Final Exam, Spring 2015

This final exam is based on 3 parts. PART 1 consists of a set of questions and represents a total of 7 points. PART 2 and PART 3 are application cases and represent 8 and 5 points respectively. As a reminder, the use of English language is needed to answer.

PART 1: Questions (7 pts)

1. What is PLM ? (1 pt)
2. What are the main functionalities of a PLM system ? (1 pt)
3. What does eBOM and mBOM mean ? What are their differences ? (1 pt)
4. What is product data ? (1 pt)
5. What are the differences between "bottom-up" and "top-down" modelling approaches in geometric modelling phase? (1 pt)
6. What are the objectives of Concurrent Engineering and its related approaches ? (2 pt)

PART 2: Skeleton-based modelling (8 pts)

By considering the following case study (See Figure 1), you have to define the final skeleton-based model. This model will be assembly-oriented (i.e. skeletons structure and assembly relationships). It is requested to develop this model in a step-by-step way. As appendix, Table 1 has been introduced in order to provide guidelines.

Table 1: Part list of the case study for PART 2.

No.	Part name
1	Screw
2	Washer 1
3	Frame 1
4	Frame 2
5	Washer 2
6	Nut
7	Bush

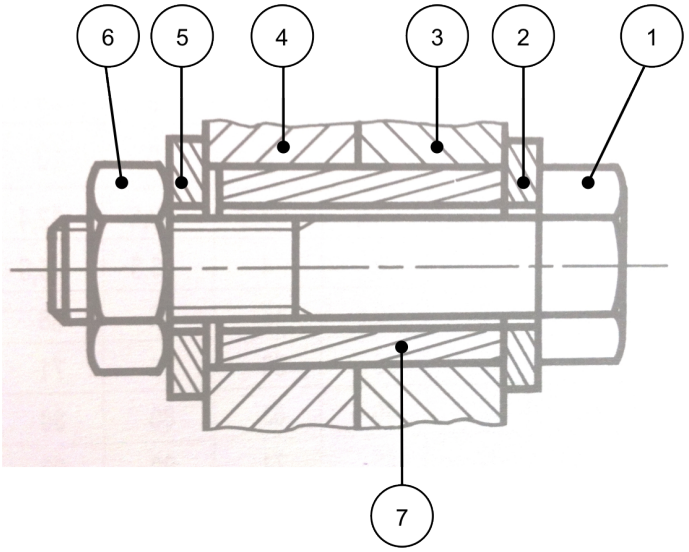

Figure 1: Mechanical assembly as a case study for PART 2.

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PART 3: Design For Assembly (5 pts)

In the following case study (See Figure 2), you have to improve this product design by considering specific DFA rules. Please introduce these rules so as to argue your decisions. Figure 2 shows a simple sub-assembly used in the construction of a gas-flow meter. The objective is to analyse the design from a DFA point of view and propose a redesign.

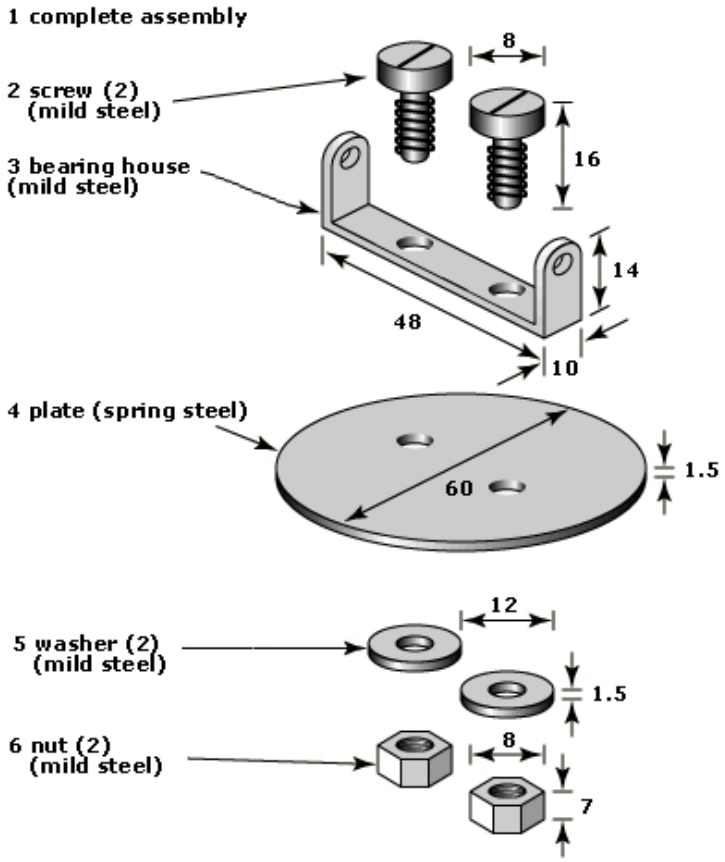

Figure 2: Case study for PART 3.

Table 1
Skeleton entities definition based on kinematic pairs.

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

End of exam.