

Series 1.

Exercise 1

- (a) Indicate the category (subtractive, replicative or additive) of each of the processes listed in Tab. 1.
- (b) For the replicative processes, try to indicate the subcategories (duplicative, expendable ...).

Process	Category	SubCategory
electro discharge machining		
machining (milling, turning, ...)		
electro chemical machining		
plastic injection		
sand casting		
deep drawing		
classical sintering		
galvanic moulding		
vacuum casting		
investment casting		

Table 1: List of some production processes

Exercise 2

- a) List some reasons that motivate the use of prototyping during the development phase of a product. Explain why all the prototyping steps must be fast.
- b) The price of any prototype depends on different parameters. List at least five of them.

Exercise 3

You have to manufacture photoresist parts (volume $V_{\text{part}} = 250 \text{ mm}^3$ and height $H_{\text{part}} = 30 \text{ mm}$) by stereolithography. The specific characteristics of the photoresist are given below:

quantity	symbol	value	unit
photopolymerization energy per unit of mass	ε	17.5	[J/g]
specific price	p_{spec}	100	[Frs/kg]
density	ρ	0.8	[g/cm ³]

Table 1: Characteristics of the photoresist

The properties and characteristics of the SLA station are

quantity	symbol	value	unit
laser power	P	0.01	W
hourly rate	R	100	[Frs/h]
layer thickness	e	25	[μm]
recoating time (per layer)	$\tau_{\text{recoat.}}$	18	[s]
number of parts that can be made on the same base-plate	n_{plate}	25	-
price to set up the machine before starting a new batch	$p_{\text{init.}}$	200	[Frs]

Table 2: Characteristics of the SLA station

Calculate the unit cost as a function of the size N of the serie to be produced.