



ANGLAIS

The Role of Simulation in Design

The potential impact of simulation is limited only by imagination. Increasingly, detailed simulation models and more powerful computers will make possible problem solving that otherwise could not be done.

In the 1970s, signal integrity was not so great a design challenge: an electrical signal sent down a wire would travel to its destination and perform its intended task without affecting any other part of the circuit. But the electronic signals in today's products — such as iPod, smart phone, laptop and networking equipment — travel at much higher speed. Furthermore, the increasing bandwidth and smaller sizes have changed everything. Now, when the higher-frequency signal is sent, the wire still carries the signal to its destination, but it also resonates and emits electromagnetic fields that interfere with other components in the product — as well as other products that happen to be in the area. In complex systems such as cars and airplanes, electronic and electromechanical components are developed by multiple companies, increasing the possibility for interference.

What are the consequences? Products become much more complicated when they include several electronics components operating at high-signal processing rates. The vast majority of the unintended signals flying around the product will probably appear as noise that has no effect on the product's operation. But can your company survive even one product failure? The downside risk of product failure and its consequences can be catastrophic. One estimate for a single product recall is \$8 million-plus — in direct costs only. More significantly, a brand that took decades to build can be destroyed in seconds.

So how should your company reject product designs with the potential to fail? In many cases, the least expensive, most effective and most insightful way to ensure product integrity is with engineering simulation. Unlike traditional prototype testing, simulation enables engineers to virtually test how a given product design will perform — well before any physical model is built — against a wide range of scenarios, some of which may be impossible to replicate experimentally. Simulation can be used at any point in the design process, but it is especially beneficial in the initial stages, when changes can be efficiently and cost effectively implemented.

Adapted from <http://investors.ansys.com/~media/Files/A/Ansys-IR/annual-reports/whitepapers/the-role-of-simulation-in-innovative-electronic-design.pdf>

I. READING COMPREHENSION (09 marks)

A) Read paragraph 2. Then complete this table with 'YES' or 'NO' to indicate the properties of electrical signals of the 1970s and the properties of today's electrical signals. (02 marks)

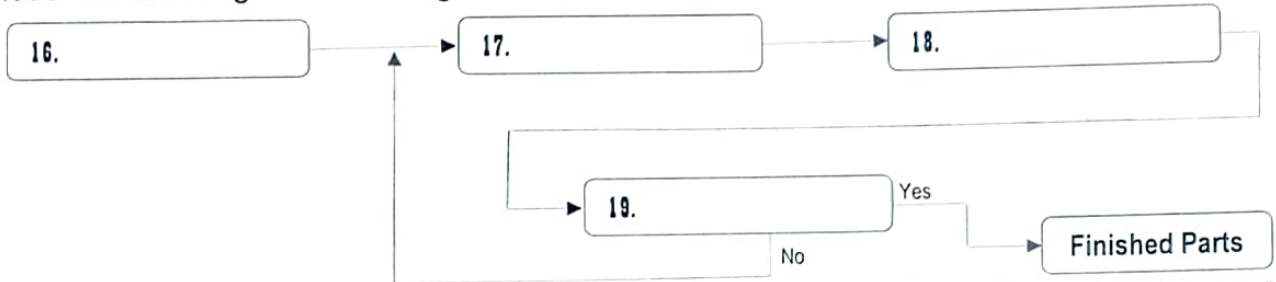
Properties	Electrical Signals of the 1970s	Electrical Signals of Today
Reach destination	YES	YES
Affect other elements	NO	3.
Travel through a wire	1.	4.
Travel very fast	2.	YES

- B) Quote from paragraphs 3-4 to decide whether the following statements are TRUE or FALSE. (0,3 marks)
5. The noise caused by unintended signals has no financial consequence for manufacturing companies.
6. Simulation helps guarantee product integrity when traditional prototype testing is impossible.
7. The most advantageous use of simulation is before the company begins manufacturing the product.
- C) Find in the paragraphs indicated words corresponding to the definitions listed below. (0,2 marks)
8. (Paragraph 1) Digital prototypes of physical products to predict performance in the real world. (2 words)
9. (Paragraph 2) The range of frequencies occupied by a modulated radio-frequency signal. (1 word)
10. (Paragraph 2) Disturbance to the normal functioning of electrical equipment and systems. (1 word)
11. (Paragraph 3) The possibility that money or the value of something might be lost. (2 words)
- D) Complete these statements based on information from the paragraphs indicated. (0,2 marks)
12. Design projects that were considered inconceivable or difficult to finalize in the past can now be realized thanks to the technical contribution of _____ and of _____ (parag.1)
13. Today's high-frequency signals do **not only** interfere with chips and parts assembled in iPods, smart phones, laptops, and networking equipment, they **also** affect _____ (parag.2)
14. The reason why there is more interference in electric circuits installed in cars or airplanes is that their chips and parts come from _____ (parag.3)
15. Most unwanted signals do not affect products negatively but product manufacturers do not want their reputation to be damaged by _____ (parag.3)

II. LINGUISTIC and COMMUNICATIVE COMPETENCE (07 marks)

E) Read this description of a simple simulation model and complete the chart below. (03 marks)

This simulation model includes 5 blocks. Parts flow to the second block—the Machine Part block representing the execution of a certain number of operations—after being generated in the Generate Parts blocks on the extreme left. Next, they go through two inspection blocks, the first of which is in the same line as the Generate Parts and the Machine Part blocks. The second inspection block (Inspection Passed?) confirms the results of the test taken in the Inspect Part block. If the verification systems approves the parts, they are directed to the Finished Parts block and are ready for assembly or packaging. If they fail the test, then they are returned to the entry of the model to run through the circuit again.



Adapted from www.researchgate.net/publication/237072067_Virtual_Factory_Data_Model_to_support_Performance_Evaluation_of_Production_Systems#pdf9

F) Choose the right options from the suggestions in parentheses to complete the passage below. (02 marks)

Simulation is a fundamental analysis tools for those responsible for the design and operation of complex processes or systems. In an increasingly competitive world, simulation has become one of the (20) _____ (most ☹ more ☹ very) powerful instruments for the growth of manufacturing companies. Simulation (21) _____ (had been ☹ used to be ☹ is) regarded as the approach of "the last resort" but today, it is viewed as an indispensable problem-solving methodology for engineers, designers, and managers. Simulation helps designers verify and validate the intended function of a product under construction, as well as the (22) _____ (manufacturability ☹ manufacturer ☹ manufactory) of the product. Several design approaches have become inevitable phases of product development in many (23) _____ (controls ☹ industries ☹ product users) and smaller businesses.

Adapted from <https://uh.edu/~lcr3600/simulation/models.html> and www.plm.automation.siemens.com/global/en/our-story/glossary/design-simulation/13152

G) Match the sentence beginnings in Box 'X' with the correct sentence endings in Box 'Y'. (02 marks)

24. Mechanical engineering, as its name suggests, deals...

25. This is the branch of engineering which includes design, analysis,...

26. The mechanical engineer may design a...

27. Mechanical engineers will analyze their design using the principles...

- a) ...plays a key role in enhancing safety, economic vitality and quality of life.

b) ...component, a machine, a system, or a process.

c) ...with the mechanics of operation of mechanical systems.

d) ...of motion, energy, and force to ensure the product functions efficiently.

e) ...testing, manufacturing, and maintenance of mechanical systems.

III. Writing: Choose ONE topic and write 150 words about it. (04 marks)

Topic 1: Why is it so important to test products (through simulation or prototype testing) before manufacturing them in series (mass production)?

Topic 2: Products which are already on sale around the world may have defects. Generally, defective products are recalled and defects fixed. Do you think that these defects happen because manufacturers rely too much on automated systems? Or do they happen because of human failure or some other reasons? Explain.