**a. Failure Modes and Effects Analysis (FMEA)**

Failure Modes and Effects Analysis (FMEA) is a systematic, step-by-step approach for identifying all possible failures in a design, manufacturing or assembly process, or a product or service. It involves reviewing as many components, assemblies, and subsystems as possible to identify failure modes, and their causes and effects. The primary goal of FMEA is to improve the quality, reliability, and safety of the product or process by anticipating potential problems before they occur.

**b. Event Tree Analysis (ETA)**

Event Tree Analysis (ETA) is a forward, top-down, logical modeling technique for both success and failure that explores responses through a single initiating event and lays a path for assessing probabilities of the outcomes. Starting from an initiating event, it identifies possible outcomes and sequences of events that could result from that initiating event, providing a comprehensive mapping of possible accident scenarios and their probabilities.

**c. Fault Tree Analysis (FTA)**

Fault Tree Analysis (FTA) is a top-down, deductive failure analysis in which an undesired state of a system is analyzed using Boolean logic to combine a series of lower-level events. The analysis involves mapping out all the paths that can lead to a particular system failure, known as the top event, and determining the root causes. FTA is widely used in risk assessment and safety engineering to identify potential causes of system failures and to evaluate the probability of different failure scenarios.

**d. Hazard and Operability Analysis (HAZOP)**

Hazard and Operability Analysis (HAZOP) is a structured and systematic examination of a complex planned or existing process or operation in order to identify and evaluate problems that may represent risks to personnel or equipment, or prevent efficient operation. HAZOP is typically used in chemical, pharmaceutical, and oil and gas industries, and it involves detailed scrutiny of process design and operation using guide words to discover deviations from design intent that could lead to hazards or operability issues.

The risk must be demonstratable that the cost involved in reducing the risk further would be grossly disproportional to the benefit gained.

As Low As Reasonably Practical

A system must offer a global level of risk no worse than that offered by an existing equivalent system.

Globally At Least Equivalent

The assessment asserts that, taken over a defined population, the system being deployed should not substantially affect the mortality in a particular area.

.

Minimum Endogenous Mortality

Order the three terms in the correct relation.

* Fault
* Error
* Failure

(a) ASIL A is the lowest whereas B,C,D (is the highest).

<b>severity> \* <probability> \* <controllability> = <ASIL level>

<severity> := S3 ; <it causes life threatening, fatal injuries that's why s3,>

<probability> := E4 ; <highly probable as the accidents might happen quite often>

<controllability> := C3 ; <extremely low controllability>

<ASIL-Level> := ASIL-D ; <highest level of integrity>