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The IEEE Standard Dictionary of Electrical and Electronics Terms

Sixth Edition



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Standards Coordinating Committee 10, Terms and Definitions
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SS See: source statements.

SSAC See: steel supported aluminum conductor.

SSAP See: address fields.

SSB See: single-sideband modulation.

SSD See: start of stream delimiter.

SSI See: soil structure interaction; small scale integration.

SSR See: software specification review.

ST See: symbol time.

stability (1) An aspect of system behavior associated with systems having the general property that bounded input perturbations result in bounded output perturbations. *Notes:* 1. A stable system will ultimately attain a steady state. 2. Deviations from this steady state due to component aging or environmental changes do not indicate instability, but a change in the system. *See also:* steady-state stability; transient stability.

(2) (perturbations) For convenience in defining various stability concepts, only those parameters or signals that are perturbed are explicitly exhibited, or mentioned, that is, for perturbations in initial states, a perturbed solution is denoted

$$\phi(x(t_0) + \Delta x(t_0); t)$$

where $\Delta x(t_0)$ represents the perturbation in initial state. Finally, the perturbed-state solution is denoted $\Delta\phi = \phi(x(t_0) + \Delta x(t_0); t) - \phi(x(t_0); t)$. (IM) [120]

(3) (power system stability) In a system of two or more synchronous machines connected through an electric network, the condition in which the difference of the angular positions of the rotors of the machines either remains constant while not subjected to a disturbance, or becomes constant following an aperiodic disturbance. *Note:* If automatic devices are used to aid stability, their use will modify the steady-state and transient stability terms to: steady-state stability with automatic devices; transient stability with automatic devices. Automatic devices as defined for this purpose are those devices that are operating to increase stability during the period preceding and following a disturbance as well as during the disturbance. Thus relays and circuit breakers are excluded from this classification and all forms of voltage regulators included. Devices for inserting and removing shunt or series impedance may or may not come within this classification depending upon whether or not they are operating during the periods preceding and following the disturbance. *See also:* steady-state stability; transient stability. (PE/T&D) [10]

(4) (oscilloscopes) The property of retaining defined electrical characteristics for a prescribed time and environment. *Notes:* 1. Deviations from a stable state may be called drift if it is slow, or jitter or noise if it is fast. In triggered-sweep systems, triggering stability may refer to the ability of the trigger and sweep systems to maintain jitter-free displays of high-frequency waveforms for long (seconds to hours) periods of time. 2. Also, the name of the control used on some oscilloscopes to adjust the sweep for triggered, free-running, or synchronized operation. *See also:* sweep mode control. (IM) 311-1970w

(5) (hydraulic turbines) Characteristics of the governing system pertaining to limitation of oscillations of speed or power under sustained conditions, to damping of oscillations of speed following rejection of load, and to damping of speed oscillations under isolated load conditions following sudden load changes. (PE) 125-1977s

(6) (electrothermic power meters) For a constant input rf power, constant ambient temperature and constant power line voltage, the variation in rf power indication over stated time intervals. *Note:* Long term stability or drift is the maximum acceptable change in 1 h. Short-term stability or fluctuation is the maximum (peak) change in 1 min. (IM) 544-1975w

(7) (nuclear power generating station) The ability of a module to attain and maintain a steady state. (PE) 381-1977w

stability, excitation-system

(8) (A) (software) The ability to continue unchanged despite disturbing or disruptive events. (B) (software) The ability to return to an original state after disturbing or disruptive events. (C/SE) 729-1983s

(9) (accelerometer) (gyros) A measure of the ability of a specific mechanism or performance coefficient to remain invariant when continuously exposed to a fixed operating condition. (This definition does not refer to dynamic or servo stability.) (AE) 528-1994

stability, absolute Global asymptotic stability maintained for all nonlinearities within a given class. *Note:* A typical problem to which the concept of absolute stability has been applied consists of a system with dynamics described by the vector differential equation

$$\dot{x} = Ax + b f(\sigma)$$

$$\sigma = c^T x$$

with a nonlinearity class defined by the conditions

$$f(0) = 0$$

$$k_1 \leq f(\sigma)/\sigma \leq k_2$$

The solution $x(t) = 0$ is said to be absolutely stable if it is globally asymptotically stable for all nonlinear functions $f(\sigma)$ in the above class. *See also:* control system. (CS/IM) [120]

stability, asymptotic (of a solution $\phi(x(t_0); t)$) The solution is

(1) Lyapunov stable, (2) such that

$$\lim_{t \rightarrow \infty} \|\Delta\phi\| = 0$$

where $\Delta\phi$ is a change in the solution due to an initial state perturbation. *See "stability" for explanation of symbols. Note:* The solution $x = 0$ of the system $\dot{x} = ax$ is asymptotically stable for $a < 0$, but not for $a = 0$. In this case

$$\phi(x(t_0); t) = x(t_0) \exp(-a(t - t_0))$$

In some cases the rate of convergence to zero depends on both the initial state $x(t_0)$ and the initial time t_0 . *See stability, equiasymptotic* for stability concepts where this rate of convergence is independent of either $x(t_0)$ or t_0 . *See also:* control system; stability. (CS/IM) [120]

stability, bounded-input-bounded-output (A) Driven stability when the solution of interest is the output solution. *See also:* control system. (B) (excitation systems) A system exhibits bounded input-bounded output (BIBO) stability if the output is bounded for every bounded input. *Note:* BIBO stability is also known as stability in the sense of Liapunov and it refers to force systems. In nonlinear systems, a bounded limit cycle appearing in the output signal is an example of BIBO stability. (CS/PE) 421A-1978s

stability, conditional (linear feedback control system) A property such that the system is stable for prescribed operating values of the frequency-invariant factor of the loop gain and becomes unstable not only for higher values, but also for some lower values. *See also:* control system, feedback. (PE) 421A-1978s

stability, driven (solution $\phi(u; t)$) For each bounded system input perturbation $\Delta u(t)$ the output perturbation $\Delta\phi$ is also bounded for $t \geq t_0$. *Note:* A necessary and sufficient condition for a solution of a linear system to be driven-stable is that the solution be uniformly asymptotically stable. *See stability* for explanation of symbols. *See also:* control system. (CS/IM) [120]

stability, equiasymptotic Asymptotic stability where the rate of convergence to zero of the perturbed-state solution is independent of all initial states in some region $\|\Delta x(t_0)\| \leq v$. *See also:* control system. (CS/IM) [120]

stability, excitation-system (synchronous machines) The ability of the excitation system to control the field voltage of the principal electric machine so that transient changes in the regulated voltage are effectively suppressed and sustained oscillations in the regulated voltage are not produced by the excitation system during steady-load conditions or following a

SEE: software specification review.

ST *See*: symbol time.

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(CAS) [13]