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AN OVERVIEW OF OSCILLATORY BEHAVIOR AND ITS SOLUTIONS

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ABSTRACT:
Oscillatory behaviour is popular area of the mathematics subject. The application oscillatory study can be witnessed in various applications. This can be understood from the benefits accruing oscillatory changes. For instance, it is described as the vehicle bounces around the centre of the lane as it moves down the road. It is basically a function or sequence which quantifies about how much that sequence or changes between extreme values. It is widely recognised in real numbers, real valued function, oscillatory of a function on interval that is open set. It is repetitive variation occurs between two or more different states. This paper outlines an overview and summarises its applications and future of functions.
Keywords: Oscillation, Behaviour, Industry applications, optimal solutions

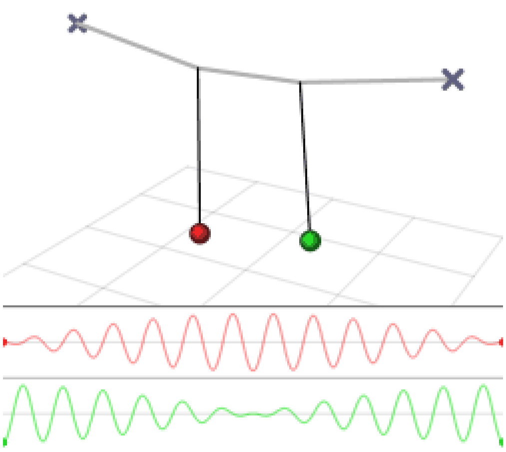
INTRODUCTION

In mechanical oscillation it is seen in the form of vibration, swinging pendulum and alternate current. This type of dynamic systems includes human heart, economic business cycle function, economic application and ecology, geology, the musical application like strings guitar, nerve cells in brain function, swelling of stars in astronomy.

- Definition : oscillator is basically an amplifier which does not have any input but it operates on the principle of positive feedback to generates an ac signal at its output.
- An amplifier act as an oscillator if and only if it satisfied BARKHAUSEN CRITERION.

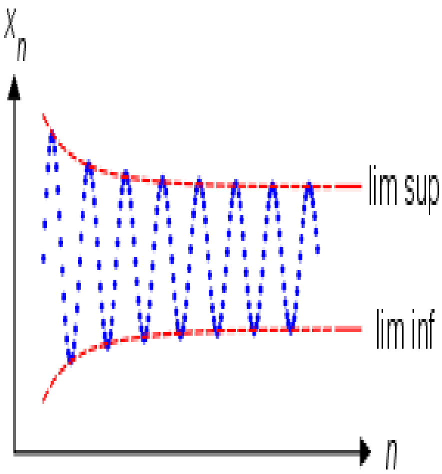
Figure No.01. Oscillatory Conditions

Coupled oscillations



Two pendulum

Oscillatory sequence



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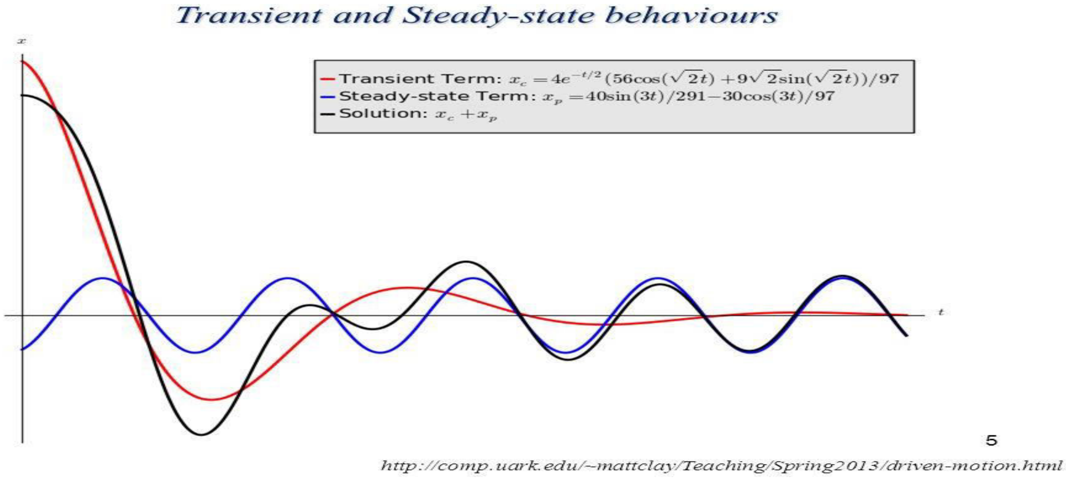
Application on a regular peripheral driving force to the damped oscillator resulting which the same period, the amplitude can increase, perhaps to disastrous proportions, as in the famous case of the Tacoma Narrows Bridge. The situation which "The condition in which damping of an oscillator causes it to return to equilibrium with the amplitude gradually decreasing to zero; system returns to equilibrium faster but overshoots and crosses the equilibrium position one or more times is called under damped. Other situation which "The condition in which the damping of an oscillator causes it to return as quickly as possible to its equilibrium position without oscillating back and forth about this position named as critically.

Figure No. 02. Driven Damped oscillations



Damped oscillations are those oscillations in which amplitude diminishes with time until they finally stop. On the other hand, forced oscillations are those oscillations in which oscillations continue up to a desired point of time with constant amplitude, by application of external periodical force.

BEHAVIOUR OF A FORCED OSCILLATOR

Forced Oscillations: Resonance. Forced oscillations occur when an oscillating system is driven by a periodic force that is external to the oscillating system. In such a case, the oscillator is compelled to move at the frequency $\nu D = \omega D/2\pi$ of the driving force.

- A mechanical oscillator of mass m, stiffness s and resistance r being driven by an alternating force $F_0 \cos\omega t$
- Mechanical equation of motion:

$$m\ddot{x} + r\dot{x} + sx = F_0 \cos \omega t$$

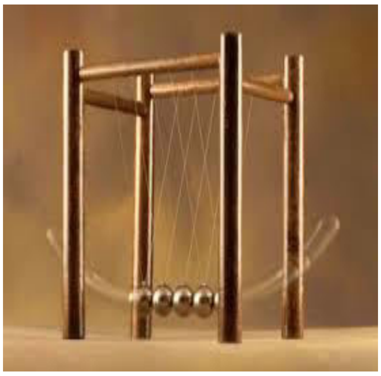
- Voltage equation in electrical case:

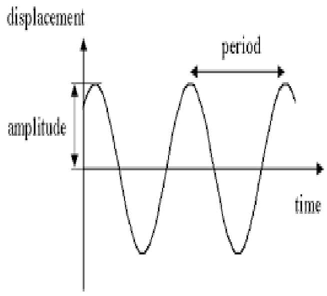
$$L\ddot{q} + R\dot{q} + q/C = V_0 \cos \omega t$$

Oscillations produced by an external periodic driving force (with a frequency that's not the natural frequency) are called forced oscillations. There is an increase in the amplitude of oscillations when the driving force is close to natural frequency of the system. Restraining of vibratory motion, such as mechanical oscillations, noise, and alternating electric currents, by dissipation of energy is known as damping force. Unless a child keeps pumping a swing, its motion dies down because of damping.

Real life evidence of oscillatory behaviour and its motion in our daily life:

- Time showing machine
- The tuning (fork)
- Flexible spring
- Strings (stretched one)
- String (motion)
- Rotation of earth (time of earthquakes)
- Atom movement in the molecules.





SUMMARY

Oscillators have attracted the attention of researchers in various scientific disciplines. An oscillating behavior is pervasive in nature, technology, and human society. Oscillation represents repetitive or periodic processes and has several remarkable features. Mathematical functions that are used to model oscillations. An oscillation is any motion that repeats itself, and the function describing a particular oscillation is an example of a periodic function. Sine and cosine are the most common periodic functions. Oscillatory behaviour following a change in conditions. The oscillatory and asymptotic behaviour marks for a class of third-order nonlinear neutral dynamic equations on time scales are presented. The results obtained can be extended to more general third-order neutral dynamic equations.

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