DEPARTMENT OF MECHANICAL ENGINEERING

K. D. K. COLLEGE OF ENGINEERING, NAGPUR

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.

Session 2011-2012.

CERTIFICATE

Certified that the project titled **"Sensitivity Analysis Of Planar Mechanism Using Instantaneous Centre Method"** is bonafide work done under my guidance and is submitted to Rashtrasant Tukadogi Maharaj Nagpur University, Nagpur for the partial fulfillment of requirement for the award of post graduation degree, **Master of Technology (M.Tech.)** in Mechanical Engineering Design (M.E.D.)

NAVEED AFROZ

Dr.C.C.Handa

Guide & Head of Department

Dept. of Mechanical Engg.
K.D.K. College of Engg., Nagpur

Dr. D.P. Singh

Principal

K.D.K.C.E. , Nagpur

Principal
K. D. K. Engg. College
NAGPUR.

ABSTRACT

A planar mechanism consists of several links some of which execute pure rotation about a fixed centre and other links have oscillatory/rotary motion or translatory motion. These links also execute rotary motion about a point in the plane of motion but its position depends on orientation of links which is callled configuration.The point about which these links rotate is called instantaneous centre, because its position changes with the change in configuration. Even the translatory link can be assumed to rotate about a point at infinity. The links also have motion relative to each other with reference to relative instataneous centres. These centres can located with the help of Kennedy's theorem. A mechanism having many links will have many relative instantaneous centres but all of them need not be determined. A relative instantaneous centre which connects required link (for which velocity is to be determined) with the link whose velocity is known is required. However some of these centres can be determined by observation,e.g.fixed centres and hinges. Fixed centres are relative to fixed link. The instantaneous centres relative to fixed link have no velocity whereas others move with velocity depending with which it is considered to move.

Machine/equipment consists of mechanisms for their successful operation. These mechanisms are designed for the desired output or the performance for specified input. Link length inaccuracies result in variation in the performance of the mechanism. Sensitivity of mechanism is the variation in the performance due to dimensional variation. Analysis is the study of motions and forces concerning different parts of an existing mechanism. The link lengths inaccuracies are due to number of factors like manufacturing errors, deflection of links, clearances in joints etc. Due to manufacturing defects and clearances the link lengths vary. This variation in the link length causes variation in desired performance of mechanism. In this project a simple class I four bar linkage is analyzed assuming that links are rigid. A generalized approach is proposed to measure the performance of a planar four bar chain using instantaneous centre method

CONCLUSION AND SCOPE FOR FUTURE WORK

9.1 Conclusion:

Based on the results and analysis the conclusions are as under:

1. From table 8.1- 8.3 the most sensitive link is L_2 followed by L_4 and L_1. The sensitivity of L_3 is very less hence has little effect on sensitivity of mechanism.
2. As per table 8.4 and its analysis the standard deviation is 1.213 Nm means the errors are negligible hence the graphical method is acceptable.
3. As per table 8.5 and its analysis the standard deviation is 0.40 Nm means the errors are negligible hence the software developed and its results are acceptable and validated.
4. On the basis of graphs 8.1 – 8.9 the values of output torque T_4 are maximum between input angle Θ_2 at 10° -15° and 210° -215° this may be out of position where link L_2 and link L_3 are either in a straight line or overlapping.
5. As link L_2 is the most sensitive link therefore closure tolerance is to be provided on link L_2 followed by link L_4, link L_1 and link L_3.

9.2 Scope for Future Work:

On the basis of the results and analysis obtained, there is lot of scope for work in this area.

1. In this we have assume the tolerance of ± 1 mm on every link one at a time for the analysis. Closure tolerance of the range ± 0.1 mm or still lower can be checked by modifying the existing software.
2. Optimum tolerance can be provided on all the links for desired performance using this approach by developing the software.
3. Better analysis can be done by providing tolerance simultaneously on all the links instead of one at a time.
4. Further analysis for knowing the cause for sudden variation in output torque can be done.