

## **CONTRIBUTION OF KINEMATIC FACTORS TO FORCES AND DISPLACEMENTS IN A COUPLER JOINT OF CRANK-ROCKER FOUR BAR LINKAGE**

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### **Abstract**

A new simplified mathematical formulation for approximation of joint displacement and vibration response of Coupler of a four bar linkage based on kinematic relations and Harmonic analysis using general Fourier force coefficients is presented in this paper. The forces on the coupler are considered in a static manner at different crank orientations for obtaining the force pattern. The complete coupler mass is being considered as a single degree of freedom system, with stiffness and damping also being considered. After obtaining the force pattern acting on the coupler the Fourier force coefficients is found and the harmonic analysis is performed for the same. The method is illustrated with a numerical example of crank-rocker mechanism. The results show that kinematic orientation of links cause variation of forces on coupler which attain peak values at two positions pertaining to stretch and overlap of crank with coupler during one cycle of revolution of crank. For different link lengths the two positions at which the peak force occur will vary. These peak force orientations pertain to peak displacement zones at a crank coupler joint.

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**Keywords:** Joint displacement analysis, Vibration analysis, Coupler vibration analysis, Harmonic analysis, axially loaded coupler.