Title: **Fabrication of two and three position synthesis of four bar chain mechanism.**

Project: Under Graduate research grant

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Executive summary:

The four-bar linkage is the simplest of all kinematic chains, which is often used to develop a useful mechanism. In this research we propose a fabrication of two and three position synthesis of four linkages, works on the principle of Grashof's law. By considering different link lengths r_1, r_2, r_3, and r_4 with four revolute pairs,in which crank link-2 (r_2) will revolve 360 degrees and link-1 as frame which is fixed among all linkes.The fabrication of two and three position synthesis can be obtained by using acrylic material ,considering time ratio(λ=1),crank angle(α =180) and rocker angle(β) which will be considered as models to conduct an experiments regularly in the field of Mechanics of Machines and show how it will be justified as non-quick return motion mechanism.

Introduction and Statement of the Problem / Project.

Introduction; A four-bar mechanism is obtained by fixing link (1) in the four revolute chains. This mechanism transfers the rotary motion of one link to an reciprocating or oscillatory motion for another link or vice versa. The links of the four-bar mechanism are represented as Link (1) considered as frame or fixed link, Link (2) as crank, Link (3) is as coupler and Link (4) is called the rocker. Based on this concept, by fixing different links different inversions of mechanisms can be obtained like beam engine, automatic steering mechanism etc.

Statement of the problem: In this project an attempt has been made to propose a two and three position synthesis of four bar linkages, works on the principle of Grashof's law.By considering different link lengths r1, r2, r3, and r4 with four revolute pairs,in which crank link-2 (r2) will revolve 360 degrees and link-1 as frame which is fixed among all linkes.The fabrication of two and three position synthesis can be obtained by using acrylic material ,considering time

ratio(λ=1),crank angle(α =180) and rocker angle(β) which will be considered as models to conduct an experiments regularly in the field of mechanics of machines.

Literature Review and Analysis of Related Work

Four bar chain mechanism is used in many applications depending upon the applications.

- One of the researches has done analytical method using computer programming is useful in determining the values of velocity and acceleration analysis at different positions of the crank. On the basis of result and analysis, it is concluded that this present method is very fast and less laborious and very efficient than graphical method for four bar mechanism. Also errors due to the graphical method are eliminated by this present method which gives better result.
- The synthesis of four-bar mechanism shows how software allows students and researchers to model and analyses in a quick and simple way n-DOF planar linkages. Using the software capabilities, the user is able to carry out a deep kinematic performance analysis of the whole mechanism. GIM software has proven to be a very effective tool to complement and reinforce the theoretical concepts explained during the lectures of subject related to Mechanism and Machine Science.
- 'Kinematic Design and Fabrication of Four Bar Mechanism to Steer a Human-Powered Vehicle'

- The aim of the project is to develop a steering mechanism for Human Powered Vehicle (HPV) where the tire has to rotate equal angle with or some preferred angle more than the handle. Four bar mechanism is one such solution for that. That mechanism is to be designed in Adams, fabricated successfully and to be implemented to HPV. The motion of links in the system must satisfy the constraints imposed by their connections. Two pairs of equal links are selected to design and fabricate the steering mechanism for HPV obeying Grashof's criterion. At the end we fabricate a mechanism to steer the HPV.

Hence by considering all reviews from the literature, we propose to fabricate two and three position synthesis of four bar linkages(mechanism) by using acrylic material.

Objectives:

- To study and understand the concept of four bar mechanism which obeys Grashofs law.
- To study the different links of four bar mechanism including crank angle, rocker angle and time ratio.
- To fabricate successfully two and three position synthesis of four bar linkages by using material as acrylic.

Research Methodology [Describe your Implementation Plan, Time-line and Milestones]

By understanding the concept of four bar mechanism and Grashof's law.

- Procurement of acrylic sheet of required thickness and bearings.
- Synthesis of two and three position four bar linkages graphically.
- Fabrication of different links based on the required length.
- Assembly of different links for the designed positions with crank angle and rocker angle.
- Testing the working of the four bar linkages.

Academic, Scientific and/or Innovation Significance

The two position and three position synthesis of four bar mechanism is a very effective tool to contribute the extra futures and strengthen the theoretical concepts explained during the lectures of subject related to mechanics of machines and Mechanism.

Benefits to Oman

- It allows the students and lecturers to understand the working of different position four bar mechanisms in the course like Mechanics of machines specially in mechanisms in all technical colleges in Oman.
- Reduce the efforts to understand the students in the field of mechanisms.
- Exact method to justify the graphically solved mechanism

Budget allocation: (In OMR

Administration cost	: 50.00
Data Collection/ Analysis	: 45.00
Materials and Supplies	: 180.00
Travel (Local Travel)	: 50.00
Research Assistants (Undergraduate)	: 60.00
Total	**: 385.00 OMR**

References;

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2. Kinematic Design and Fabrication of Four bar Mechanism to Steer a Human-Powered Vehicle' by K L University | KLU · Department of Mechanical Engineering
3. https://oman.desertcart.com/products/48163601-clear-acrylic-sheet-a-4-size-4-mm-thick
4. Three Coupler Position Synthesis and Kinematic Analysis for a Couple of Four-Bar Mechanism B. Diriba Hirpo School of mechanical Engineering, Tianjin University of Technology and Education, Tianjin 200333, China, International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value (2016): 79.57 | Impact Factor (2015): 6.391
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