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**Topic of Research:** Some studies on modeling of epicyclic gear trains

Generation of epicyclic gear trains (EGTs) and detection of isomorphism in EGTs have been found a lot of attentions by various researchers for the last few years. Most of the design practices in engineering are the combination of synthesis and analysis. Synthesis is a conceptual phase of engineering design and an important stage during the design process. Synthesis is the creation of a mechanism to satisfy a desired functional requirement of the designer based on their intuition, ingenuity and experience. Kinematic structure of EGTs is identified using by graphical and numerical methods. Graphical methods are based on visual inspection of schematic diagrams of EGTs and many of the numerical methods are based on theory of graphs. Identification of isomorphism among various EGTs of given number of links and DOF is very important in synthesis of EGTs.

Various methods have been suggested by several kinematicians for detection of isomorphism in planer kinematic chains (PKCs) and epicyclic gear trains (EGTs), but everyone has found some difficulties to address new issues. In this thesis, the identification of isomorphism in EGTs has carried out by different methods like, Modified path matrix method(MPM), Modified gradient method (MGM), Bocher's technique (BT) and Wiener number technique with various number of links and degree of freedoms. These approaches are partially analytical and partially algorithmic. The concept of graph theory is used for determination of isomorphic property in epicyclic gear trains and their mechanisms to avoid duplication. All proposed methods have examined on the basis of various examples from

four-link, five-link, six-link, and eight-link with 1-2 degree of freedom EGTs. All the examples have been found fully satisfactory results with existing literature.

The generation of graphs is major research areas for synthesis and analysis of EGTs. Although, many authors have been developed different methods for generating the graphs of EGTs up to seven links, 1-DOF. But, every method has its own limitations and not classified displacement graph and rotational graph properly. The current work has been carried out the generation of EGTs up to eight-links 1-DOFs with the help of new algorithm “Wiener number technique”. Wiener strings and wiener number are used to determination of structural and rotational graphs of EGTs. The combination of genetic graph approach and wiener number technique has been carried out for the generation of graphs in EGTs. The results are obtained in generation of EGTs with up to eight links in fully agreement with those of earlier literature.

Seven methods have been compared as three methods (Hamming number technique, Eigen values and Eigen vectors & Characteristic polynomial method) already suggested by some researchers of identification of isomorphism in KCs as well as EGTs. Four new developed methods (Modified path matrix method, Modified gradient method, Bocher’s technique & Wiener number technique) are compared with others method for detection and generation of graphs of four, five and six link EGTs. All results have found full agreements with existing results as earlier discussed.