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*A co-ideal based identity-summand graph of a commutative semiring*

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**Abstract:** Let  $I$  be a strong co-ideal of a commutative semiring  $R$  with identity. Let  $\Gamma_I(R)$  be a graph with the set of vertices  $S_I(R) = \{x \in R \setminus I : x + y \in I \text{ for some } y \in R \setminus I\}$ , where two distinct vertices  $x$  and  $y$  are adjacent if and only if  $x + y \in I$ . We look at the diameter and girth of this graph. Also we discuss when  $\Gamma_I(R)$  is bipartite. Moreover, studies are done on the planarity, clique, and chromatic number of this graph. Examples illustrating the results are presented.

**Keywords:** strong co-ideal;  $Q$ -strong co-ideal; identity-summand element; identity-summand graph; co-ideal based

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