ON THE SEMIRING $\begin{pmatrix} R & \Gamma \\ S & L \end{pmatrix}$

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Abstract: H. S. Vandiver introduced the notion of semiring as a generalization of ring in the year 1934. A ring R becomes a semiring when $(R, +)$ is a semigroup instead of a group. In 1964, N. Nobusawa, to provide algebraic home to $\mathrm{Hom}(A, B)$, $\mathrm{Hom}(B, A)$ and to $M_{m\times n}(R)$, $M_{n\times m}(R)$, where A and B are additive abelian groups and R is a ring, introduced the notion of an algebraic structure what is known as Γ-ring. Γ-ring not only generalizes the notion of ring but also the notion of ternary ring. In 1981, M. K. Sen further generalized the notion of Γ-ring and introduced the notion of Γ-semigroup. Taking impetus from M. K. Sen's work on Γ-semigroup M. M. K. Rao introduced the notion of a Γ-semiring in 1995. It turns out to be a generalization of semiring as well as of Γ-ring. In 2002 the present author and T. K. Dutta introduced the notion of operator semirings of a Γ-semiring and developed the theory of Γ-semiring to a considerable extent. In 2008 the present author and B. C. Saha introduced the notion of a both sided Γ-semiring, i.e., Nobusawa Γ-semiring. To every Nobusawa Γ-semiring one can associate a matrix like semiring $\begin{pmatrix} R & \Gamma \\ S & L \end{pmatrix}$, where R and L are respectively the right and left operator semirings of S. Though the concept of a semiring generalizes that of a ring the ideal properties of semiring sometimes differ from the properties of ring ideals. In order to amend this gap, the concept of k-ideals and h-ideals in a semiring were introduced by D. R. LaTorre in 1965. By using the notion of k-ideal of a semiring Olson et al. introduced the notions of pre-prime and pre-semiprime ideals. The present author and B. C. Saha showed that like k-ideals, h-ideals could also be used to define new types of ideals called h-prime and h-semiprime ideals in semirings. These notions were then transferred to Γ-semirings. In this talk, we investigate the properties of k-prime, k-semiprime, h-prime and h-semiprime ideals in the matrix semiring $S_2 = \begin{pmatrix} R & \Gamma \\ S & L \end{pmatrix}$. Besides this we show that the semiring S_2 provides an example of Morita context for semiring introduced by Dutta and Das. This in other words means that corresponding to every Nobusawa Γ-semiring there exists a Morita contex for semirings. To conclude the talk we discuss the reverse question namely: Does there exist a Nobusawa Γ-semiring S corresponding to a Morita context of semirings such that the Morita context induced by S is the given one?