N-COLORED GENERALIZED FROBENIUS PARTITIONS: GENERALIZED KOLITSCH IDENTITIES

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Let $N \geq 1$ be a squarefree integer coprime to 6. Let $c\phi_N(n)$ denote the number of N-colored generalized Frobenius partitions of n introduced by Andrews in 1984, and P(n) denote the number of partitions of n. We prove that

$$c\phi_N(n) = \sum_{d|N} N/d \cdot P\left(\frac{N}{d^2}n - \frac{N^2 - d^2}{24d^2}\right) + b(n)$$

where $C(z) := (q;q)_{\infty}^{N} \sum_{n=1}^{\infty} b(n)q^{n}$ is a cusp form in $S_{(N-1)/2}(\Gamma_{0}(N),\chi_{N})$. This extends and strengthens earlier results of Kolitsch and Chan-Wang-Yang which treated the cases when N is a prime. We then use properties of modular forms to show that b(n) is small compared to the linear combinations of partition function in our formula. This establishes an asymptotical formula for $c\phi_{N}(n)$ in terms of the partition function. These results are from a joint work with Professor Khoa Dang Nguyen of the University of Calgary.