

Abstract

In this thesis, we present several new congruences for various partition functions analogous to Ramanujan's congruences. First of all, we find infinite families of new congruences for ℓ -regular partitions for $\ell \in \{5, 6, 7, 49\}$ by employing p -dissections of q -products and also find alternative proofs of the congruences for 10- and 20-regular partitions which were proved earlier by Carlson and Webb (*Ramanujan J.* **33**, 329–337 (2014)) by using the theory of modular forms.

Next, by employing Ramanujan's theta functions and some known identities for the Rogers-Ramanujan continued fraction, we obtain some interesting congruences modulo 5 for the partition function $p_k(n)$ for $k \in \{2, 3, 4\}$, where $p_k(n)$ is the number of 2-color partitions of n where one of the colors appears only in parts that are multiples of k . The congruence for $p_2(n)$ was earlier proved by Chen and Lin (arXiv:0910.1263v1 [math.NT] 7 Oct 2009) with the aid of modular forms.

We also find several new congruences for some recently defined partition functions, namely, broken k -diamond partitions, k dots bracelet partitions and singular overpartitions by using Ramanujan's theta functions and the binomial expansion of q -products. We also establish a relation between number of 5-cores and Ramanujan's famous tau function $\tau(n)$ and find several new congruences for number of 3- and 5-cores.