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EXTENDED VALUES OF RAMANUJAN'S TAU FUNCTION

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Dedicated to Professor G.E. Andrews on his seventieth birthday

Abstract: Present paper concerns mainly with verification and extension of table for $\tau(1), \tau(2), \tau(3), \tau(4), \cdots, \tau(29), \tau(30)$ of Ramanujan. Our extended table for $\tau(31), \tau(32), \cdots, \tau(37)$ is obtained without using certain arithmetical functions defined by Ramanujan and also the theory of elliptic functions.

Keywords and Phrases: Ramanujan's tau Function
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1. Introduction

In this paper, we obtain the values of $\tau(31), \tau(32), \tau(33), \tau(34), \tau(35), \tau(36)$ and $\tau(37)$, where $\tau(n)$ is Tau function of Ramanujan, defined as follows:

$$\sum_{n=1}^{\infty} \tau(n)\ x^n \ = \ x\left\{\prod_{n=1}^{\infty}(1-x^n)\right\}^{24} \tag{1.1}$$

Ramanujan [3, p.196, Table(V); see also 1,2] calculated the values of $\tau(1), \tau(2), \tau(3), \tau(4), \cdots, \tau(29), \tau(30)$, by means of the theory of elliptic functions and certain arithmetical functions such as $F_{r,s}(x)$, $\Phi_{r,s}(x)$, $E_{r,s}(n), \sigma_s(n)$, Riemann's Zeta function $\zeta(n)$, greatest integer function $[x]$, theory of symbols o, O, continued fraction, asymptotic expansion, some trigonometrical identities, inequalities, Gamma function, theory of order of error terms, number theory, convergence and divergence of infinite series.

We have obtained the values of $\tau(1), \tau(2), \tau(3), \tau(4), \cdots, \tau(36), \tau(37)$ without using the theory of elliptic functions and certain arithmetical functions etcetera. In this sequence, we consider the whole square of power series $\sum\limits_{n=0}^{\infty} b_n x^n$ and collect the terms upto x^{36}. Thus we have: