CONGRUENCE PROPERTIES OF PARTITIONS

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Let $p(n)$ denote the number of unrestricted partitions of n. Ramanujan conjectured† that

If $\delta = 5^a 7^b 11^c$ *and* $24\lambda \equiv 1 \pmod{\delta}$, *then*

$$p(\lambda),\ p(\lambda+\delta),\ p(\lambda+2\delta),\ \ldots \equiv 0 \pmod{\delta}.$$

This result has been proved in a number of special cases, *e.g.* when‡

$$\delta = 5,\ 7,\ 11,\ 5^2,\ 7^2,\ 11^2,\ 5^3.$$

A table of partitions recently calculated by H. Gupta§ shows that *the above conjecture is false for* $\delta = 7^3$. In fact,

$$24.243 = 24(343-100) \equiv -2400 = -7^4+1 \equiv 1(7^3),$$

but
$$p(243) = 133978259344888,$$

and it is easily verified that $p(243) \equiv 0(7^2)$ but $p(243) \not\equiv 0(7^3)$.

AN APPROXIMATE FUNCTIONAL EQUATION OF SIMPLE TYPE (II): APPLICATIONS TO CERTAIN TRIGONOMETRICAL SERIES

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This paper is concerned with some applications of the theorem (Theorem A) of the preceding paper (I)**. In order to facilitate reference, the numbering of paragraphs and formulae is consecutive to that of (I).

4. I begin with some rather trivial specializations of Theorem A.

THEOREM B. *If* $\phi(t)$ and $\psi''(t)$ *are logarithmico-exponential functions (L-functions) such that, as* $t\to\infty$, $\psi'(t)\to\infty$, *and* $\phi^2(t) > A\psi''(t)$, *then the*

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† *Proc. Camb. Phil. Soc.*, 19 (1919), 207–210.

‡ The case $\delta = 125$ has been proved recently by U. Krečmer, *Bull. Acad. Sci. U.R.S.S.* (1933), No. 6, 763–800.

§ His table, which gives $p(n)$ up to $n = 300$, has been communicated to the London Mathematical Society. I am indebted to Mr. Gupta for providing me with a copy.

|| $a \equiv b(c)$ means $a \equiv b \pmod{c}$.

¶ Received in revised form 22 January, 1934.

** J. R. Wilton, *Journal London Math. Soc.*, 9 (1934), 194–201.