CONGRUENCES FOR $(4,5)$-REGULAR BIPARTITIONS INTO DISTINCT PARTS

M. Prasad and K. V. Prasad*

Department of Mathematics,
PES College of Engineering,
Mandya, Karnataka - 571401, INDIA

E-mail : prasadmj1987@gmail.com

*Department of Mathematics,
VSK University, Ballary, Karnataka - 583105, INDIA

E-mail : prasadkv2007@gmail.com

Abstract: Let $B_{4,5}(n)$ denote the number of $(4,5)$-regular bipartitions of a positive integer n into distinct parts. In this paper, we establish many infinite families of congruences modulo powers of 2 for $B_{4,5}(n)$. For example,

$$\sum_{n=0}^{\infty} B_{4,5}\left(16 \cdot 3^{2\alpha} \cdot 5^{2\beta} \cdot 7^{2\gamma}n + 2 \cdot 3^{2\alpha} \cdot 5^{2\beta} \cdot 7^{2\gamma} - 1\right) q^n$$
$$\equiv 2f_1^3 \pmod 4, \text{ for all } \alpha, \beta, \gamma \geq 0.$$

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1. Introduction

Throughout this paper, we let $|q| < 1$. We use the standard notation

$$f_k := (q^k; q^k)_\infty.$$