



Department of Mathematical Sciences

**Report on research collaboration**

between

**Prof. Nayandeep Deka Baruah (along with Mandeep Kaur, Research scholar), Department of Mathematical Sciences, Tezpur University**

and

**Mingyu Kim and Byeong-Kweon Oh,**  
**Department of Mathematical Sciences and Research Institute of Mathematics, Seoul National University, Seoul 151-747, Korea**

**Title of collaboration:**

PROOFS OF SOME CONJECTURES OF Z. -H. SUN ON RELATIONS BETWEEN SUMS OF SQUARES AND SUMS OF TRIANGULAR NUMBERS.

**Summary of collaboration:**

Z.-H. Sun (Acta Arith., 175 (2016), 169-189. ) found many relations between  $N(a, b, c, d; n)$  and  $T(a, b, c, d; n)$  and conjectured 23 more relations. Yao (, J. Math. Anal. Appl., 453 (2017), 125-143) proved five of Sun's conjectures by using  $(p, k)$ -parametrization of theta functions and stated that six more could be proved by using the same method. Sun (Int. J. Number Theory, 15 (2019), 969-989) himself confirmed two more conjectures by proving a general result whereas Xia and Zhong (J. Math. Anal. Appl., 463 (2018), 1-18) proved three more conjectures of Sun by employing theta function identities. We could prove six of the remaining seven conjectures by employing Ramanujan's theta function identities. A collaborative research work was undertaken by Nayandeep Deka Baruah along with his Ph.D. student Mandeep Kaur of the Department of Mathematical Sciences with Mingyu Kim and Byeong-Kweon Oh of Seoul National University, Korea to find a proof of the seventh conjecture of Sun. A joint paper was written containing the proofs of all the remaining conjectures of Sun.

**Duration of collaboration:**

The collaboration started in **March 2018** and culminated when the paper was finally accepted in **December 2018**. The paper appeared in an issue of the journal in March 2020.

**Details of collaboration:** Details of collaboration could be found in the following paper.

Nayandeep Deka Baruah, Mandeep Kaur, Mingyu Kim and Byeong-Kweon Oh, Proofs of some conjectures of Z. -H. Sun on relations between sums of squares and sums of triangular numbers, Indian J. Pure Appl. Math., 51(1): 11-38, March 2020, DOI: 10.1007/s13226-020-0382-z.



**Prof. Milan Nath**

**Head**

**Department of Mathematical Sciences**

**Tezpur University**