**Highlights**

* A concentrated photovoltaic thermal model system with nanofluid spectral splitting was developed.
* 50 ppm concentration ratio of ZnO nanofluid integrated with a well-designed model system is identified in providing 65.2 % overall energy conversion efficiency.
* Nanofluid based spectral splitting was employed in effective utilization of solar radiation intensity to a photovoltaic thermal system.
* The numerical analysis of nanofluid based optical filtration photovoltaic thermal system has been done.
* It has been shown that the CPV/T system electrical energy conversion was closer to quantum efficiency.

**Novelty**

Light beam focused by Fresnel lens to ZnO nanofluid flowing in sequentially arranged filtering tubes of optimum diameter employed and obtained energy conversion up to the quantum efficiency and overall performance more than 50.35%.

* **Why do you think the paper is important?**

The paper is important in designing an efficient energy conversion system by focusing the sun into a proposed spectral filtering nanofluid concentration and generating intended energy of interest with a system efficiency of up to 85 %.

* **Why the Journal publish**

The study could be published to transfer knowledge we studied for effective light beam focusing, allocation, traveling of optimum distance and uniform distribution, and thermophysical properties of the sample used in the model.