Nanofluids are the suspensions of solid nanoparticles in the liquids as base fluids. They have been the latest engineering material among the investigators as they exhibit promising enhanced thermal properties and many other possible developments. In this paper, experimental studies are conducted in the effort to measure the thermal conductivity and viscosity of nanocellulose particles dispersed in ethylene glycol and water (EG-water) mixture with the weight concentration of 40/60% volume ratio. The experimental measurements are performed at various volume concentrations up to 1.3% and temperature ranging from 30 °C to 70 °C. The result demonstrates that as the measured temperature increases, thermal conductivities increases as well. The nanofluid has maximum thermal conductivity enhancement of 9.05% were found at 1.3% volume concentration when it is compared to the base fluid at 30 °C. As expected, viscosity values increase when the volume fraction increases. However, viscosities of the nanofluids are found to be decreasing when the temperature increases. At 1.3% volume concentration and 30 °C, nanofluid viscosity recorded the highest value, about 4.16 times of the base fluid. Finally, a new correlation with acceptable accuracy was proposed to predict the thermal conductivity and viscosity of nanofluids by using the obtained experimental data.