Performance of the geosynthetic-reinforced foundation systems with different reinforcement forms and having clay subgrades of varying strengths has been investigated by performing physical model tests. Model tests were carried out on a circular footing of 150 mm diameter ($D$) resting on 1 m × 1 m × 1 m foundation bed having clay subgrades of different undrained shear strengths ($c_u$), ranging from 7 to 60 kPa. Five different series of laboratory model tests were performed on homogeneous and layered foundation systems. The layered systems were comprised of unreinforced and reinforced sand (80% relative density) of varying layer thicknesses ($H = 0.63$ to $2.19D$) overlying the clay subgrades. The reinforcements used in these tests were planar geogrid, geocells, and geocell-geogrid combined. The results are presented in terms of bearing pressure-settlement and surface deformation profiles. Besides, different bearing pressure ratios are introduced to compare the foundation behavior and reinforcement contributions. It was noticed that reinforcement of any form can improve the performance of clay subgrades, depending on footing settlement, layer thickness, and subgrade strength. In general, the improvement factors were decreased with increase in subgrade strengths ($c_u$). A maximum of about 12-fold improvement in bearing pressure was obtained for very soft clay subgrade of 7 kPa with geocell-geogrid configuration; while, the maximum bearing pressure of about 720 kPa was noted for the similar reinforcement configuration with $c_u = 60$ kPa. Optimum height of geocell-mattress for softer subgrades ($c_u \leq 15$ kPa) was $1.57D$. In the case of stiffer subgrades ($c_u > 15$ kPa) the optimum height was $1.05D$. Beyond these optimum heights buckling of geocell-walls and sand squeezing influenced the performance negatively. The geocells contribution, in improved bearing pressures, was higher for stiffer subgrades, while geogrid contribution was higher for softer subgrades. Regression models were developed, based on the selected test data, to evaluate the bearing pressure at a given settlement level for a foundation system with any clay subgrade and reinforcement configuration. A detailed illustration of the applicability of the regression equations, highlighting the importance of subgrade strength in optimizing reinforced foundation design, was presented.