Dynamics of Structures, 6th Edition
Promo Video
TRANSCRIPT

In the Pearson eText for the sixth edition of Dynamics of Structures: Theory and Applications to Earthquake Engineering by Anil Chopra, new Interactive figures provide engaging content to help students learn. Students can experiment with different parameters and see how the analysis changes in real time. Let's look at a couple of examples.

We are in Chapter 6, Earthquake Response of Linear Systems. This interactive figure shows how the earthquake response of a linear single-degree-of-freedom system depends on the natural vibration period and damping ratio. The upper part of the figure shows the El Centro ground motion, and the lower part displays the deformation of the system as a function of time.

The damping ratio is set to 2% and we set the period to 0.5 seconds. You can see the computed response with the peak value of 2.67 inches. Let us change the period to one second. The response now differs significantly and the peak value is 5.97 inches. Finally, we change the period to 2 seconds, and observe that the peak value is 7.47 inches. The damping ratio is the same for the three systems, so that only the differences in their natural vibration periods are responsible for the large differences in the deformation responses.

Now we will observe the deformation response of three systems to the same ground motion. The vibration period is set to 2 seconds, the same for the three systems. Let us specify zero damping for the first system, and observe its response that has a peak deformation of 9.91 inches. If we increase the damping to 2%, the peak response reduces to 7.47 inches, and if we further increase the damping to 5%, the response reduces further, now with a peak value of 5.37 inches. We observe the expected trend that systems with more damping respond less than lightly damped systems.

In the next chapter, Earthquake Response of Inelastic Systems, in the section on Yielding, the interactive figure illustrates how the response of a single-degree-of-freedom elastoplastic system differs from a linear system. Let us choose the vibration period of the system as 0.5 seconds and its damping ratio as 5%. The normalized yield strength of the elastoplastic system is specified as 0.25. Shown in the figure are the deformation histories for the yielding system and for the corresponding linear system; also identified are time intervals during which the system is yielding.

The time variation of deformation of the yielding system differs from that of the linear system; the peak values are 1.75 inches and 2.25 inches, respectively. Decreasing the normalized yield strength to 0.125, observe that the system with lower yield strength yields more frequently and for longer intervals.

Twenty of these interactive figures throughout the Pearson eText of the sixth edition of Dynamics of Structures by Anil Chopra provide students with engaging content and the opportunity to experiment with different parameters and see how the analysis changes in real time.