1. (20) Give brief definitions for the terms below:
   a. epicenter
   b. base excitation
   c. period
   d. stiffness
   e. damping ratio.

2. (30) A temporary support for a concrete batch mixer is constructed as a steel frame braced with steel cables as shown. Note: Only one side of the support structure is shown. The mixer weighs 12500 lb. Do the following:
   a. Compute the lateral stiffness of the support.
   b. Compute the natural period of vibration of the structure.
   c. Estimate an appropriate damping factor, give reasons for your choice.
   d. If the structure is subjected to harmonic ground motion with a period of 0.2 sec and an amplitude of 0.8", estimate the relative displacement of the mixer.

3. (50) The displacement history of a single degree of freedom (SDOF) system is shown on the attached sheet. Do the following:
   a. State whether the motion is free vibration or forced vibration.
   b. Determine the natural frequency, and, if applicable, the forcing frequency.
   c. Determine the initial conditions.
   d. State if the motion is damped, if so determine the damping ratio.
   e. Write the equation, including the numerical values determined above, that describes the displacement history shown.