

## Passive Structural Control (HW 4)

Due: 4/25

### 1. Energy formulations

Using any numerical integration method (e.g. Newmark-  $\beta$  ) and structural analysis program (e.g. SAP2000 、 ETABS 、 PISA3D) to calculate the absolute and relative energy of the single degree of freedom system under the specified ground motion (attached). Discuss the difference of results by these two methods. (Assume damping ratio= 5%) You are required to plot “Input energy”, “Kinetic energy”, “Potential energy”, and “Modal damping energy” in the same figure for each case.

(1)  $M_1=500$  kg,  $K_1=1973921$  N/m,  $T_1=0.1$  sec

(2)  $M_2=500$  kg,  $K_2=19739$  N/m,  $T_2=1$  sec

(3)  $M_3=500$  kg,  $K_3=789.57$  N/m,  $T_3=5$  sec

The units of the attached files are in “sec, gal”.

(1) Near-fault earthquake record: **TCU052.txt**

(2) Far-fault earthquake record: **TCU072.txt**

**Only needs to consider the EW direction and discuss your results.**

### 2. Reading Assignment

A STUDY OF THE MODAL STRAIN ENERGY METHOD FOR  
VISCOELASTICALLY DAMPED STRUCTURES

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