Advanced Structural Design Final Assignment 課題

2008/08/12 Fujino 藤野

I am extremely sorry for posting the final assignment with a large delay.

Choose one problem from the two, Problem 1 and Problem 2 and through a parametrical study, discuss the results from a viewpoint of structural design under dynamic forces.

（以下の 2 問 a,b のうち一問を選び，計算結果をレポートの形でまとめよ．パラメトリックな計算結果に基づき，動的外力を受ける構造物の設計という立場から考察し，まとめること．）

Try to use MATLAB to calculate the seismic response.
（Those who do not have MATLAB nearby can borrow a CD with MATLAB.from Mr. Dinh. Please come to pick it up. You have to return it when finished. If you do not return it, you will not get a grade MATLABがそばにない人は，Dinh さんのところでCDを借りてください．あとで返すこと．返さないと成績はつきません．）

Length few pages to several pages including figures
枚数は数枚程度にまとめよ
Ground motions are provided in bridge lab. homepage
地震動は橋梁研のHPから

Consult Mr Dinh dinh@bridge.t.u-tokyo.ac.jp if you have any question.

Problem 1

a） Base-isolation, using laminated rubber bearings for example, is a very effective way to protect structures against strong earthquakes Consider one-floor building (shown as Figure 1) excited by the ground motion in the earthquake as shown, and use a 2DOF model for the calculation. Describe the effectiveness of the base-isolation of structures (shown as Figure 1). The damping coefficient c can be varied.

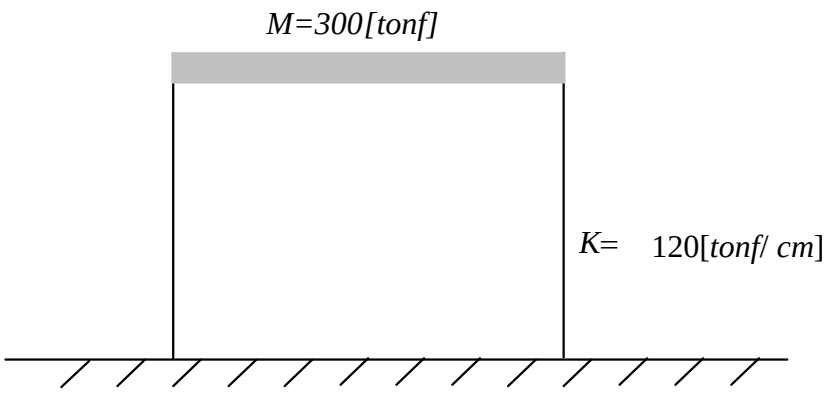


Figure 1. Original structure

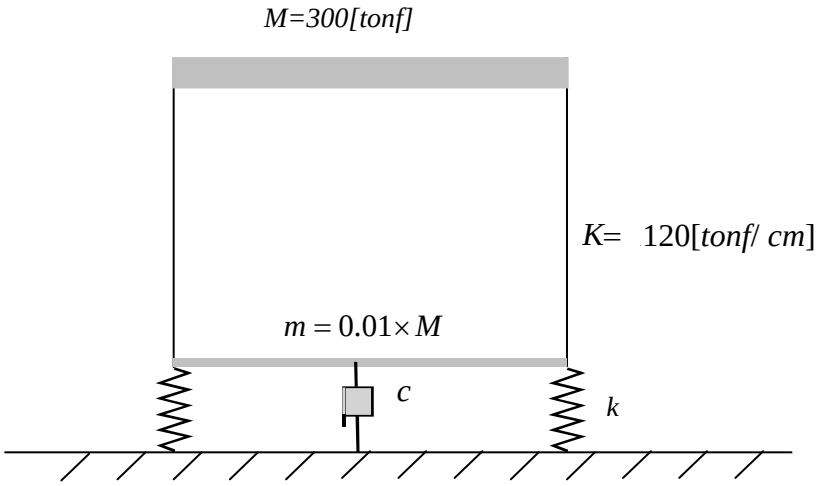


Figure 2. Base-isolated structure

This 2DOF model can be shown as Figure 3. And use the model shown as Figure 4 to develop the numerical model.

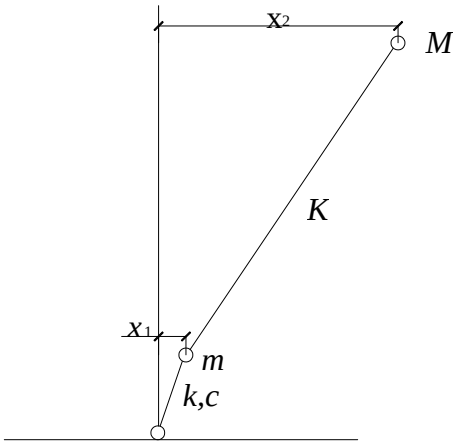


Figure 3. 2DOF model

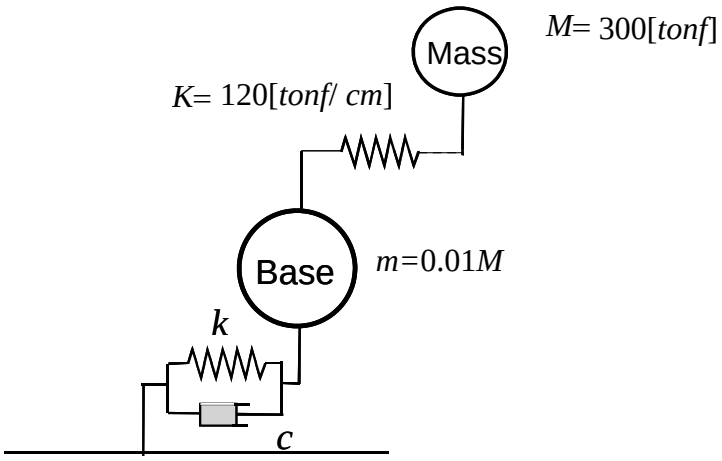


Figure 4. Numerical model

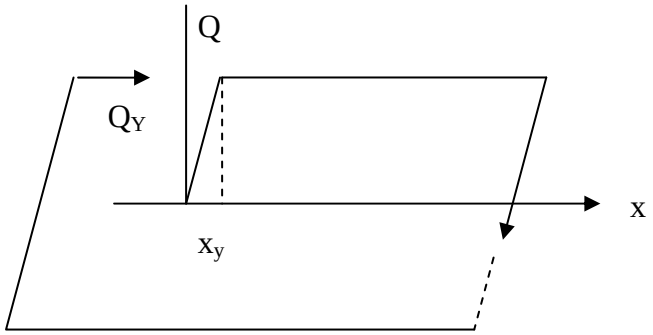
Problem2

1) Consider a seismic response of a SDOF with perfect elasto-plastic hysteresis property.

$$m\ddot{x} + c\dot{x} + Q(x) = -m\ddot{z}$$

$$\ddot{x} + 2\xi\omega_0\dot{x} + \frac{QF(x)/m}{m} = -\ddot{z}$$

F_0 is the yielding force. Determine F_0 such that the max. acceleration of the given ground motion $\ddot{z}(t)$ (El centro) is 100 gal. Change the level of ground motion and discuss how the seismic response changes. $\xi = 0.02$,
$T_0 = 2\pi/\omega_0 = 0.5\text{sec}$.



2) Discuss the accuracy of the rule

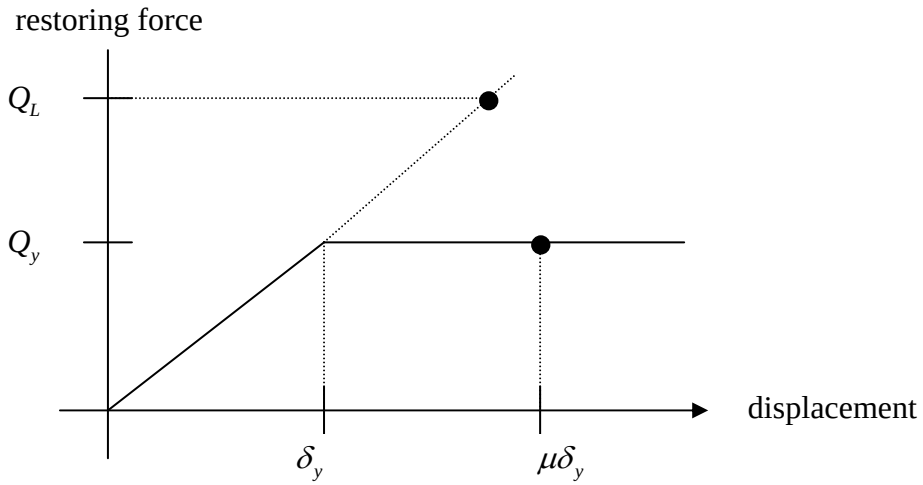
$$\frac{Q_y}{Q_L} = \frac{1}{\sqrt{2\mu - 1}}$$ (μ:ductility)

Under various combination of yield level and ground motion. Assume damping ratio ξ=0.02(2%)

完全弾塑 1 自由度系の地震応答を考える.

$$\frac{Q_y}{Q_L} = \frac{1}{\sqrt{2\mu - 1}}$$ （μ ： じん性）

のルールがどのくらい成り立つかをﾊﾟラメトリックな計算から調べよ．誤差について議論すること.



1. 橋梁の耐震設計と耐震補強 / M. J. N. Priestley, F. Seible, G. M. Calvi 著 ; 川島一彦監訳, 東京 : 技報堂出版 1998.4
2. 構造物の免震・防振・制振 / 武田寿一編 ,東京 : 技報堂出版, 1988.5.
3. 免震設計入門 / R. I. スキナー, W. H. ロビンソン, G. H. マックベリー共著, 東京 : 鹿島出版会 1996.11

Deadline of the assignment is the **Aug. 28 (Thu), 2008**.
Submit it by email (Fujino office No.1 Eng Bldg 2F, Bridge & Structure Lab)
E-mail: bridge.report@bridge.t.u-tokyo.ac.jp

レポート課題と知らせが遅れて失礼しました．成績が遅れてもかまわないのであれば９月５日(金)まで出せばＯＫです．

Note: You can submit the assignment report by Sept. 5 (Fri) if the grade can be delayed.