Questions for Week 7:

(1). What are the roles of the abdominal and back muscles during full body swinging about the wrist as a pin joint?

Ans. The abdominal muscles acts as the agonist while the back muscles act as the antagonists.

(2). What is the significant utility of the Inverse Dynamic Analysis procedure?

Ans. It reduces the complicated system of multiple unknown forces and moments into a simple system of 3 unknowns.

(3.). Derive the velocity relation of both the arms during swinging assuming them as lumped masses.

Ans: $\bar{r}_1 = h\hat{j} + d\hat{i} - \frac{l}{2}\cos\theta\,\hat{i} - \frac{l}{2}\sin\theta\,\hat{k}$

$\bar{r}_2 = h\hat{j} + d\hat{i} - \frac{l}{2}\cos\theta\,\hat{i} + \frac{l}{2}\sin\theta\,\hat{k}$.

$\bar{v}_1 = \frac{\partial \bar{r}_1}{\partial t} = \frac{l}{2}\sin\theta\,\hat{i} - \frac{l}{2}\cos\theta\,\hat{k}$.

$\bar{v}_2 = \frac{\partial \bar{r}_2}{\partial t} = \frac{l}{2}\sin\theta\,\hat{i} + \frac{l}{2}\cos\theta\,\hat{k}$.

(4). For the same case, derive the angular momentum of the system of arms swinging about the shoulder axis.

Ans. $\bar{H}_0 = \bar{r}_1 \times m_a \bar{v}_1 + \bar{r}_2 \times m \bar{v}_2$.

$= 2 d l m \dot{\theta} \cos\theta \hat{j}$

(5). What is the attribute different between the swinging of arms and legs while walking?

Ans.. To maintain the same frequency of oscillation for the arms and legs, the amplitude is more in arm swinging to compensate for the increased mass and length of legs.