QUIZZ: Advances in Robotics and Control

Consider the following class of robotic system:

$$M(q)\ddot{q} + H(q, \dot{q}) = \tau, \tag{1}$$

where $q \in \mathbb{R}^n$ is the generalized position, $M \in \mathbb{R}^{n \times n}$ is the invertible mass matrix and $\tau \in \mathbb{R}^n$ is the control input. Answer the followings:

(1) Derive an inverse dynamics controller for the robotic system to track a desired trajectory of q^d. [5]

(2) Via Lyapunov method, analyse and comment on the stability of the closed-loop system. [5]