QUIZZ: Advances in Robotics and Control

Q.1 Consider the following class of robotic system:

$$\ddot{q} + \theta_1 \dot{q} + \theta_2 q = \tau, \tag{1}$$

where $q(t)$ is the generalized position, τ is the control input and θ_1, θ_2 are *unknown* constants. Let $q^d(t)$ be a bounded desired trajectory to be tracked and $e = q - q^d$ be the tracking error. Design an adaptive control based on filtered tracking error based method that can ensure adaptive convergence of tracking error. [30]

Q.2 Consider the following system

$$\dot{x} = u, \tag{2}$$

Comment on the stability when

- (i) $u = -sgn(x)$ [5]
- (ii) $u = -sgn(x)$ when $|x| > \epsilon$ and $u = -(x/\epsilon)$ when $|x| \leq \epsilon$, where $\epsilon > 0$ is a constant. [15]