

## Module 4F1: Control System Design, 2012 exam answers

1. (a) -
  - (b) i. -
  - ii.  $\alpha > 0, k_p > 0, k_i > 0$  and  $\alpha > \frac{k_i}{k_p}$ .
  - iii. -
  - iv. -
  - v. -
  - vi.  $v(t) \rightarrow v_0, \dot{v}(0) = -g \sin(\theta)$ .
2. (a) i.  $-2 < k < -1$ .
  - ii. -
  - iii. -
- (b)  $T(2) = 1$ .
- (c)  $\epsilon \geq 0.748$ .
3. (a) i. -
  - ii. -
  - iii. All-pass term is a time delay of  $\approx 0.28$  seconds.
  - iv. -
  - v.  $0 < k < 16$ .
- (b) i. -
  - ii. -

KG 2012