For 2c) and 2d)

$K_p = 4$, $K_d = 1.7$

for 2d) $C = 2.6$

2e) The positive integer reference value for which the controller stops working is $r = 181°$. When this reference value is set, the system approaches 180° normally, then when it crosses 180° quickly loops back around to approach 180° again. This is because of the fact that the angle measurements are defined on a scale from -180° to 180°. when the arm crosses 180° the angle is measured as -180° which gives an error of 181° - (-180°) = 361°! The controller reacts by turning up the positive thrust proportionately to the error, causing the arm to spin around in the forward θ direction.