Find the kinematics of vertical piston

The figure shows a 2D mid-section of ship model which is pivoted at point O and needs to undergo simple harmonic roll motion about O, $\phi = \phi_a sin(\omega t)$. The beam of the ship model is b. The top corner of the deck at a distance r_1 from the pivot O is connected to the vertical piston rod BC with the link AB of length r_2 with hinges at A and B. The vertical piston is at a distance l from the pivot O. Friction in hinge joints A and B and the vertical rod BC are negligible.

    i Determine the equation for stroke, s of the vertical piston rod BC in order to achieve such prescribed roll motion ϕ?

    ii Can the same motion be imposed on the ship if the point A and B are identical (i.e without link AB)?