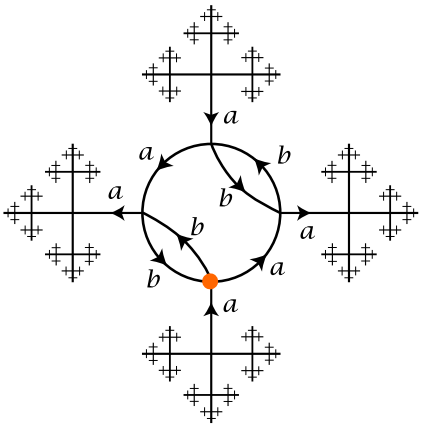
Name: _____ Score (Out of 7 points):

1. (7 points) Consider the wedge $X = S^1 \vee S^1$ of circles with wedge point x_0. We use the letters a and b to label the two circles, and (by mild abuse of notation) to represent the corresponding generators of $\pi_1(X, x_0)$,which we may identify with the free group $F_{\{a,b\}}$ on a and b.

   Below is a (based) cover $p : (\widetilde{X}, \widetilde{x}_0) \to (X, x_0)$. The covering map p is specified by the edge labels and orientations. A distinguished basepoint $\widetilde{x}_0$ is marked with an orange dot.



   Let $H := p_* \left(\pi_1 \left(\widetilde{X}, \widetilde{x}_0 \right) \right)$.

   Fill in the following. No justification necessary, however (if applicable) please indicate your choice of maximal tree, to help me verify your solution.

   (a) The degree of this cover is ...

   (b) Circle one: this cover is ... REGULAR NOT REGULAR

   (c) The deck group is (as an abstract group) ...

   (d) State a free generating set for H.

   (e) Circle precisely the elements of $F_{\{a,b\}}$ below that are contained in H.

   a a^2 b^2 ab ba ab^2 b^2ab $abab$

   (f) Circle precisely the elements of $F_{\{a,b\}}$ below that are in the normalizer $N(H)$ of H.

   a a^2 b^2 ab ba ab^2 b^2ab $abab$