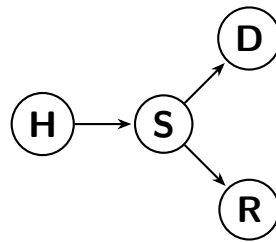We consider a model of disease evolution based on a time homogeneous continuous time Markov process with the following transition graph

1. Give the general form of the transition rates matrix Λ.

2. Diagonalise Λ and calculate $\exp t\Lambda$.

3. Calculate the survival function $S(t) = 1 - \mathbb{P}[X_t = D]$.

4. Calculate the law of the following random variable

$$T = \min_t \{X_t = D \text{ or } R\}.$$