Generation Rules

$$\frac{x :_\lambda \tau \in \Gamma}{\Gamma \vdash x : \tau \rightsquigarrow \epsilon}\ \textsc{VarCon}_\lambda$$

$$\frac{\alpha \text{ fresh} \qquad x : \sigma \in \Gamma}{\Gamma \vdash x : \alpha \rightsquigarrow \mathsf{InstanceOf}(\sigma, \alpha)}\ \textsc{VarCon}$$

$$\frac{\alpha \text{ fresh} \qquad \Gamma, x :_\lambda \alpha \vdash e : \tau \rightsquigarrow C}{\Gamma \vdash \lambda x.e : \alpha \to \tau \rightsquigarrow C}\ \textsc{Abs}$$

$$\frac{\Gamma, x : \sigma_1 \vdash e : \tau_2 \rightsquigarrow C}{\Gamma \vdash \lambda(x :: \sigma_1).e : \sigma_1 \to \tau_2 \rightsquigarrow C}\ \textsc{AbsA}$$

$$\frac{\Gamma \vdash e_1 : \tau_1 \rightsquigarrow C_1 \qquad \Gamma \vdash e_2 : \tau_2 \rightsquigarrow C_2 \qquad \alpha \text{ fresh}}{\Gamma \vdash e_1\, e_2 : \alpha \rightsquigarrow C_1 \wedge C_2 \wedge \tau_1 \sim \tau_2 \to \alpha}\ \textsc{App}$$

$$\frac{\Gamma \vdash e : \tau_2 \rightsquigarrow C}{\Gamma \vdash (e :: \sigma_1) : \sigma_1 \rightsquigarrow C \wedge \mathsf{InstanceOf}(\tau_2, \sigma_1)}\ \textsc{Annot}$$

$$\frac{\Gamma \vdash e_1 : \tau_1 \rightsquigarrow C_1 \qquad \Gamma, x :_\lambda \tau_1 \vdash e_2 : \tau_2 \rightsquigarrow C_2}{\Gamma \vdash \mathsf{let}\ x = e_1\ \mathsf{in}\ e_2 : \tau_2 \rightsquigarrow C_1 \wedge C_2}\ \textsc{Let}$$

$$\frac{\Gamma, x : \sigma_1 \vdash e_1 : \sigma_1 \rightsquigarrow C_1 \qquad \Gamma, x : \sigma_1 \vdash e_2 : \tau_2 \rightsquigarrow C_2}{\Gamma \vdash \mathsf{let}\ x :: \sigma_1 = e_1\ \mathsf{in}\ e_2 : \tau_2 \rightsquigarrow C_1 \wedge C_2}\ \textsc{LetA}$$

$$\frac{\begin{array}{c}\Gamma \vdash e : \tau \rightsquigarrow C \\ \text{for each branch } K_i\,\overline{x_i} \to u_i \text{ do} \\ K_i : \forall \overline{a}\,\overline{b_i}.Q_i \Rightarrow \overline{v_i} \to \mathsf{T}\,\overline{a} \in \Gamma \qquad \overline{b_i} \text{ fresh} \\ \Gamma, \overline{x_i : [\overline{a \mapsto \gamma}]v_i} \vdash u_i : \tau_i \rightsquigarrow C_i \\ \overline{\delta_i} = fuv(\tau_i, C_i) - fuv(\Gamma, \overline{\gamma}) \\ C_i' = \begin{cases} C_i \wedge \tau_i \sim \beta & \text{if } \overline{b_i} \text{ and } Q_i \text{ empty} \\ \forall \overline{\delta_i}.\,([\overline{a \mapsto \gamma}])Q_i \supset C_i \wedge \tau_i \sim \beta \end{cases}\end{array}}{\Gamma \vdash \mathsf{case}\ e\ \mathsf{of}\ \{\overline{K_i\,\overline{x_i} \to u_i}\} : \beta \rightsquigarrow C \wedge \mathsf{T}\,\overline{\gamma} \sim \tau \wedge \bigwedge C_i'}\ \textsc{Case}$$