\[ x(t) = A \sin \left( \frac{2 \pi f_c}{f_r} t + \phi(t) \right) \]
\[ = A \sin \frac{2 \pi f_c}{f_r} t \cos \phi(t) + A \cos \frac{2 \pi f_c}{f_r} t \sin \phi(t) \]
\[ x(t) = A \left[ \sin \frac{2 \pi f_c}{f_r} t + \phi(t) \right] \cos \phi(t) \]

a) Transmission bandwidth same as AM: \[ 2W \]
b) Schematic diagram

c) SNR of received signal same as AM:

\[ SNR = \frac{2 f_c A^2}{2 NW} \]