6.

a) $R|+\rangle = |n;+\rangle$

$\Rightarrow$ if $R = \begin{pmatrix} c & a \\ d & b \end{pmatrix}$, $c = \cos\theta/2$, $d = \sin\theta/2\, e^{i\phi}$

~~reach~~ where $\vec{n} = \cos\theta\,\hat{z} + \sin\theta\cos\phi\,\hat{x} + \sin\theta\sin\phi\,\hat{y}$

R is rotation-operator $\Rightarrow R^{\dagger}R = I$

$$\Rightarrow \begin{pmatrix} 1 & a\cos\theta/2 + e^{-i\phi}b\sin\theta/2 \\ \bar{a}\cos\frac{\theta}{2} + \bar{b}\sin\frac{\theta}{2}e^{-i\phi} & |a|^2+|b|^2 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$\Rightarrow a\cos\frac{\theta}{2} + b\sin\frac{\theta}{2} = 0$$

$$|a|^2 + |b|^2 = 1$$

solving these, $a = \sin\frac{\theta}{2}e^{i\Omega}$, $\Omega \in \mathbb{R}$

$b = -\cos\frac{\theta}{2}e^{i\phi}e^{i\Omega}$

$\Rightarrow R|-\rangle$ is upto a phase $e^{i\Omega}$, equal to $|n;-\rangle$

b) $R\otimes R|\psi\rangle = \frac{1}{\sqrt{2}}(R|+\rangle \otimes R|-\rangle - R|-\rangle \otimes R|+\rangle)$

$$= e^{i\Omega}\frac{1}{\sqrt{2}}\Big(\big(\cos\tfrac{\theta}{2}|+\rangle + \sin\tfrac{\theta}{2}e^{i\phi}|-\rangle\big) \otimes \big(\sin\tfrac{\theta}{2}|+\rangle - \cos\tfrac{\theta}{2}e^{i\phi}|-\rangle\big)$$
$$- \big(\sin\tfrac{\theta}{2}|+\rangle - \cos\tfrac{\theta}{2}e^{i\phi}|-\rangle\big) \otimes \big(\cos\tfrac{\theta}{2}|+\rangle + \sin\tfrac{\theta}{2}e^{i\phi}|-\rangle\big)\Big)$$

$$= -\frac{e^{i\Omega}e^{i\phi}}{\sqrt{2}}(|+\rangle\otimes|-\rangle - |-\rangle\otimes|+\rangle)$$

Thus it is equal to $|\psi\rangle$ upto a phase