Question-1: Let, 145=210) $\neq B11$). Then, find an unitary matrix M such that, $M(\Phi)=10$) and $M(\Phi^{\perp})=11$, where $(\Phi^{\perp})=P^*(0)-4^*(1)$. Solution

cet, $M = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ be an unitary matrix which

Satisfy all the condition.

Now,
$$M(P) = 10$$
)
$$\Rightarrow (P) = M^{+}(0) = \begin{pmatrix} a^{+} & c^{+} \\ b^{+} & a^{+} \end{pmatrix} \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$=) \qquad \begin{pmatrix} \alpha \\ \beta \end{pmatrix} = \begin{pmatrix} \alpha^* \\ b^* \end{pmatrix}$$

$$=) \qquad \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} \checkmark^* \\ \beta^* \end{pmatrix}$$

Also,
$$M(\Phi^f) = II$$

$$= \int |\Phi^f| = M^* \begin{pmatrix} 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} + d^* \end{pmatrix} \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$= \begin{pmatrix} c \\ d \end{pmatrix} = \begin{pmatrix} B \\ -q \end{pmatrix}$$

$$M = \begin{pmatrix} x^* & \beta^* \\ \beta & -\alpha \end{pmatrix}$$