

Q1) Bulk rotation of similar metric:-

Ans)  $ds^2 = \rho^2 d\tau^2 - d\rho^2 - dy^2 - dz^2$

wick rotation:-

$$\tau \rightarrow i\tau \rightarrow d\tau \rightarrow i d\tau$$

~~$ds^2$~~

$$\rightarrow ds^2 = -(\rho^2 d\tau^2 + d\rho^2 + dy^2 + dz^2)$$

$$\rightarrow \|g_{\mu\nu}\| = \text{Diag}(-\rho^2, -1, 1, 1)$$

$\Rightarrow ds^2 < 0$  always  $\Rightarrow$  always space-like