Q6). Find the work done in moving a particle from $(0,1,-1)$ to $(\pi/2,-1,2)$ in a force of field $F = (y^2\cos x + z^3)\hat{i} + (2y\sin x - 4)\hat{j} + (3xz^2 + 2)\hat{k}$.

Sol^n. Here in Question, there is no mention of Path., Hence, we need to find the curl of F, if curl of F is zero then we can choose a path by own.

$$\nabla \times F = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ y^2\cos x + z^3 & 2y\sin x - 4 & 3xz^2 + 2 \end{vmatrix}$$

$$= \left[\frac{\partial}{\partial y}(3xz^2+2) - \frac{\partial}{\partial z}(2y\sin x - 4)\right]\hat{i}$$

$$-\hat{j}\left[\frac{\partial}{\partial x}(3xz^2+2) - \frac{\partial}{\partial z}(y^2\cos x + z^3)\right]$$

$$+\hat{k}\left[\frac{\partial}{\partial x}(2y\sin x - 4) - \frac{\partial}{\partial y}(y^2\cos x + z^3)\right]$$

$$= (0-0)\hat{i} - \hat{j}\left[3z^2 - 3z^2\right] + \hat{k}\left[2y(\cos x) - 2y\cos x\right]$$

$$= \underline{\underline{0}}$$

curl of F is $\underline{\underline{0}}$.

if the F is irrotational then integral is exact differeAcence

$$= \left[\int_{y,z\ \text{const}} (y^2 \cos x + z^3) \cdot dx + \int_{\substack{x=0 \\ z=\text{const}}} (2y \sin x - 4) \cdot dy + \int_{\substack{x=0 \\ y=0}} (3xz^2 + 2) \right]_{(0,1,-1)}^{(\pi/2, -1, 2)}$$

$$= \left[(y^2 \sin x + xz^3) - 4y + 2z \right]_{(0,1,-1)}^{(\pi/2, -1, 2)}$$

$$= \left[(-1)^2 \sin \pi/2 + \frac{\pi}{2}(2)^3 - 4(-1) + 2 \times 2 \right] - \left[(1)^2 \sin 0 - 0(-1)^3 - 4(1) + 2(-1) \right]$$

$$= \left[(1) + 4\pi + 4 + 4 - 0 - 0 + 4 + 2 \right]$$

$$\boxed{= \underline{15 + 4\pi}}$$