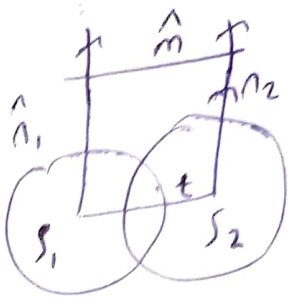
Let t be tangent of surface S_1 & S_2 and $\hat{n}_1$, $\hat{n}_2$ be $\perp$ to surface S_1 & S_2 respectively.



then $\hat{m}$ which is parallel to t is $\perp$ to $\hat{n}_1$ & $\hat{n}_2$

$$\longrightarrow \hat{n}_1 = \nabla(x^2+y^2-z) = 2x\hat{i} + 2y\hat{j} - \hat{k}$$

$$\longrightarrow \hat{n}_2 = \nabla(x+z-3) = \hat{i} + \hat{k}$$

then

$$\hat{m} = \hat{n}_1 \times \hat{n}_2$$

at $(1,1,2)$, $\hat{m} = \begin{vmatrix} i & j & k \\ 2 & 2 & -1 \\ 1 & 0 & 1 \end{vmatrix} = 2\hat{i} - 3\hat{j} - 2\hat{k}$

now since, $\hat{m}$ & $\hat{t}$ are parallel

So, equation will be at $(1,1,2)$

$$\frac{x-1}{2} = \frac{y-1}{-3} = \frac{z-2}{-2}$$

now put option (a) - $(-1,-2,4)$

$$\frac{-1-1}{2} = \frac{-2-1}{-3} = \frac{4-2}{-2} \Rightarrow -1 = 1 = -1$$ (contradiction ✗)

put all option and check

option (b) is correct