

SNS COLLEGE OF TECHNOLOGY



(An Autonomous Institution) Coimbatore-641035.

**UNIT-I VECTOR CALCULUS** DIVERGENCE AND CURL OF A VECTOR FIELD Drugence and curl: J. Dry  $\vec{F} = \nabla \cdot \vec{F}$ a. curl  $\vec{F} = \nabla \times \vec{F}$ Peoblems: J. I F=x2T+y2J+x2R, Then for V. F and VXF Soin Caren F= 227+ y2 J+ 2 R  $\nabla \cdot \vec{F} = \frac{\partial}{\partial x} (x^2) + \frac{\partial}{\partial u} (y^2) + \frac{\partial}{\partial x} (z^2)$ = 2x + 2y + 2z  $\nabla \cdot \vec{F} = 2(x + y + z)$ and  $\nabla x \vec{F} = \begin{vmatrix} \vec{F} & \vec{J} & \vec{K} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \end{vmatrix}$  $= \overline{T} \begin{bmatrix} \frac{\partial}{\partial y} (x^2) - \frac{\partial}{\partial z} (y^2) \end{bmatrix} - \overline{J} \begin{bmatrix} \frac{\partial}{\partial x} (x^2) - \frac{\partial}{\partial z} (x^2) \end{bmatrix}$  $+ \vec{R} \int \frac{\partial}{\partial x} (y^2) - \frac{\partial}{\partial y} (x^2)$ = 0 T + 0 T + 0 K VXF = 0 2] Determane the constant 'a' to that the vector  $\vec{F} = (x+z)\vec{T} + (3x+ay)\vec{J} + (x-5z)\vec{K}$  is Such that its difrequence is zero. 80/n. Given DOE - 0 Now  $\frac{\partial}{\partial x}(x+x) + \frac{\partial}{\partial y}(3x+\alpha y) + \frac{\partial}{\partial x}(x-5x) = 0$ 1 + a - 5 = 0

|a=4

23MAT103- DIFFERENTIAL EQUATIONS AND TRANSFORMS

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K.PALANIVEL,AP/MATHS



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**UNIT-I VECTOR CALCULUS** DIVERGENCE AND CURL OF A VECTOR FIELD B find  $\nabla \cdot \left( \frac{1}{2} \overrightarrow{\gamma} \right)$ Soln. Let デ=xr+yr+xR よう = オマ+ サラ+ ス か Noco,  $\nabla \cdot \left(\frac{1}{3} \cdot \vec{s}\right) = \left(\vec{T} \cdot \frac{\partial}{\partial x} + \vec{J} \cdot \frac{\partial}{\partial y} + \vec{K} \cdot \frac{\partial}{\partial x}\right) \cdot \left(\frac{x}{3} \cdot \vec{T} + \frac{y}{3} \cdot \vec{J} + \frac{z}{3} \cdot \vec{K}\right)$  $= \frac{\partial}{\partial x} \left( \frac{x}{y} \right) + \frac{\partial}{\partial y} \left( \frac{y}{y} \right) + \frac{\partial}{\partial x} \left( \frac{x}{y} \right)$  $= \frac{r(1) - \frac{\partial r}{\partial x}}{\sqrt{2}} + \frac{r(1) - \frac{\partial r}{\partial y}}{\sqrt{2}} + \frac{r(1) - \frac{\partial r}{\partial y}}{\sqrt{2}} + \frac{r(1) - \frac{\partial r}{\partial x}}{\sqrt{2}}$  $= \frac{1}{\sqrt{2}} \left[ \tau - \varkappa \left( \frac{\varkappa}{\tau} \right) + \tau - \Im \left( \frac{y}{\tau} \right) + \tau - \varkappa \left( \frac{z}{\tau} \right) \right]$  $=\frac{1}{x^2}\left[3v-\frac{x^2}{v}-\frac{y^2}{x}-\frac{x^2}{x}\right]$  $= \frac{1}{\sqrt{2}} \left[ 3v - \frac{1}{v} \left( x^2 + y^2 + z^2 \right) \right]$  $= \frac{1}{\sqrt{2}} \left[ \frac{3}{\sqrt{2}} - \frac{1}{\sqrt{2}} \frac{\sqrt{2}}{\sqrt{2}} \right] = \frac{1}{\sqrt{2}} \left[ \frac{3}{\sqrt{2}} - \frac{1}{\sqrt{2}} \right]$  $=\frac{1}{2^{a}}(ar)$ = -2  $\nabla \cdot \left( \frac{1}{\gamma} \overrightarrow{\gamma} \right) = \frac{2}{\gamma}$ 

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