Appendix F

Comparison of the Nomenclatures and Notations of the Quantities Used in This Book and in the Book by Stratton [5]

Present Book (1)	Quantities	Stratton's Book (2)
$\mathbf{a} \cdot \mathbf{b}$	scalar product	$\mathbf{a} \cdot \mathbf{b}$
$\mathbf{a} \times \mathbf{b}$	vector product	$\mathbf{a} \times \mathbf{b}$
$\mathbf{p}_i$	(1) primary vectors (2) unitary vectors	$\mathbf{a}_i$
$\mathbf{r}^i$	(1) reciprocal vectors (2) reciprocal unitary vectors	$\mathbf{a}^i$
$\mathbf{p}_i \cdot \mathbf{p}_j = \alpha_{ij}$	(1) scalar products of $\mathbf{p}_i$ (2) scalar products of $\mathbf{a}_i$	$\mathbf{a}_i \cdot \mathbf{a}_j = g_{ij}$
—	(2) scalar products of $\mathbf{a}^i$	$\mathbf{a}^i \cdot \mathbf{a}^j = g^{ij}$

Present Book (1)	Quantities	Stratton's Book (2)
$\Lambda = \mathbf{p}_1 \cdot (\mathbf{p}_2 \times \mathbf{p}_3)$	a volume parameter in GCS	$g^{1/2} = \mathbf{a}_1 \cdot (\mathbf{a}_2 \times \mathbf{a}_3)$
$\mathbf{F} = \sum_i f_i \mathbf{r}^i$ $= \sum_j g^j \mathbf{p}_j$	vector function in component form in GCS	$\mathbf{F} = \sum_i f_i \mathbf{a}^i$ $= \sum_j f^j \mathbf{a}_j$
$f_i = \mathbf{p}_i \cdot \mathbf{F}$	(1) primary component (2) covariant component	$f_i = \mathbf{a}_i \cdot \mathbf{F}$
$g^j = \mathbf{r}^j \cdot \mathbf{F}$	(1) reciprocal component (2) contravariant component	$f^j = \mathbf{a}^j \cdot \mathbf{F}$
v_i —	(1) coordinate variables (2) coordinate variables along $\mathbf{a}_i$ (2) coordinate variables along $\mathbf{a}^i$	u^i u_i
$\hat{u}_i$	unit vectors in OCS	$\mathbf{i}_i$
h_i	metric coefficients in OCS	h_i
$\Omega = h_1 h_2 h_3$	product of metric coefficients	—
$x, y, z; x_i$	rectangular variables	x, y, z
$\hat{x}, \hat{y}, \hat{z}; \hat{x}_i$	unit vectors in rectangular system	$\mathbf{i}_i$
r, θ, z	cylindrical variables	r, θ, z
$\hat{r}, \hat{\theta}, \hat{z}$	unit vectors in cylindrical coordinate system	$\mathbf{i}_1, \mathbf{i}_2, \mathbf{i}_3$
R, θ, ϕ	spherical variables	r, θ, ϕ
$\hat{R}, \hat{\theta}, \hat{\phi}$	unit vectors in spherical coordinate system	$\mathbf{i}_1, \mathbf{i}_2, \mathbf{i}_3$
$d\mathbf{R}_p$	differential of position vector	$d\mathbf{r}$
$\boldsymbol{\nabla}$	symbolic vector	—
∇f	gradient of a scalar function	∇f
$\nabla \mathbf{F}$	gradient of a vector function	$\nabla \mathbf{F}$
$\boldsymbol{\nabla} \mathbf{F}$	divergence of a vector function	$\nabla \cdot \mathbf{F}$
$\boldsymbol{\nabla}\!\!\!\!\times\; \mathbf{F}$	curl of a vector function	$\nabla \times \mathbf{F}$
$\boldsymbol{\nabla} \nabla f$	Laplacian of a scalar function	$\nabla \cdot \nabla f; \nabla^2 f$
$\boldsymbol{\nabla} \nabla \mathbf{F}$	Laplacian of a vector function	$\nabla \cdot \nabla \mathbf{F}; \nabla^2 \mathbf{F}$
$\boldsymbol{\nabla}\!\!\!\!\times\; \boldsymbol{\nabla}\!\!\!\!\times\; \mathbf{F}$	curl curl $\mathbf{F}$	$\nabla \times \nabla \times \mathbf{F}$
$\nabla_s f$	(1) surface gradient of a scalar function	—
$\boldsymbol{\nabla}_s \mathbf{F}$	(1) surface divergence of a vector function	—
$\boldsymbol{\nabla}\!\!\!\!\times_s \mathbf{F}$	(1) surface curl of a vector function	—
$[T_{ij}]$	tensor of rank 2	${}^2\mathbf{T}$
T_{ij} —	(2) component of a tensor of rank 2 (2) divergence of a tensor of rank 2	T_{ij} $\mathrm{div}^2\mathbf{T}$
$\bar{\bar{F}}$	(1) dyadic function	—
$\boldsymbol{\nabla} \bar{\bar{F}}$	(1) divergence of a dyadic	—
$\boldsymbol{\nabla}\!\!\!\!\times\; \bar{\bar{F}}$	(1) curl of a dyadic	—

F-1 Typesetting the New Notations for Divergence and Curl

To facilitate the new notations for curl and divergence, it helps to know how to typeset them. Dr. Leland Pierce of the University of Michigan has created TEX symbols (usable also in LATEX) for the S-vector ∇, divergence operator ∇, and curl operator ∇. The following LATEX document:

```
\documentstyle[12pt]{article}
\begin{document}
\font\tttt=cmsy5
\def\taisvec{\nabla\!\!\!\!\raise0.31ex\hbox{- -}\,}
\def\taidivg{\nabla\!\!\kern-2.5pt\raise0.5ex\hbox to6pt{$\cdot$}}
\def\taicurl{\nabla\!\!\!\kern-1.5pt\raise0.8ex\hbox to7pt{\tttt\char'002}}

\begin{eqnarray*}
\taicurl\bf{E} &=& -\frac{\partial\bf{B}}{\partial t}
\\
\taicurl\bf{H} &=& \bf{J} + \frac{\partial \bf{D}}{\partial t}
\\
\taidivg\bf{D} &=& \rho
\\
\taidivg\bf{B} &=& 0
\end{eqnarray*}
\end{document}
```

will produce

$$\nabla \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$

$$\nabla \mathbf{H} = \mathbf{J} + \frac{\partial \mathbf{D}}{\partial t}$$

$$\nabla \mathbf{D} = \rho$$

$$\nabla \mathbf{B} = 0$$

For Macintosh© or PC users of Microsoft Word 6.0© or higher, the following steps can be used to typeset the new divergence and curl operators.

1. Pull down the "Insert" menu and select "Field."
2. Select "Equation" to insert a blank equation field in the document.
3. For Macintosh users, hold down the control key and click on the blank equation. For PC users, right click the blank equation field. Select "Change" to show the equation field.

4. Edit the equation field as follows:
   (a) For $\bar{\nabla}$ vector: {EQ\O(∇,\S\UP5(−))}.
   (b) For $\dot{\nabla}$ operator: {EQ\O(∇,\S\UP5(.))}.
   (c) For $\overset{\times}{\nabla}$ operator: {EQ\O(∇,\S\UP5(×))}.

   Note that "∇," "." and "×" are characters of Symbol Font and entered by using "Insert Symbol" command. The size of "∇" is 12 point. The size of "." and "×" is 4 point. Note that "." is the big dot character of Symbol Font, not period, and "×" is the cross character of Symbol Font, not "x."
5. To save typing time, the above can be saved and recalled by using the "Autotext" command. For instance, select the operators $\dot{\nabla}$, pull down the "Edit" menu, and select "Autotext" to store the operator, say, by the name "dot." For subsequent use of the operator, type the name "dot" followed by the function key F3, then the $\dot{\nabla}$ operator will appear automatically.

For more information, see the help menu of Microsoft Word 6.0© on the following topics: Insert Field, Insert Symbol, EQ, and Autotext.