B Yi Y '7 \ UbW b 'Z0f': fUi Yb 'ja
C`XYbVi f[ Yf`A 0bghYf`UbX. `Dfc[fUa a`
5a`6U``V`Y]VYb

8 Ug`bYi Y`Dfc[fUa a` \YZh` 5a`6U``V`Y]VYb`XYf
?ccfX]b]Yfi b[gghY``Y': fUi Yb`i bX`K` ]fhgWUZh`V]YhYh
nU\`fY]WY`K`Y]hYfV]`Xi b[ga`0[ `]W\`Y]hYb`ja`C`XYbVi f[Yf
A 0bghYf`UbX"

8 Ug`bYi Y`Dfc[fUa a` \YZh` 5a`6U``V`Y]VYb`XYf
?ccfX]b]Yfi b[gghY``Y': fUi Yb`i bX`K` ]fhgWUZh`ja`C`XYbVi f[Yf
A 0bghYf`UbX`]gh`XU`i bX`gc f[ h`Z0f`Zf]gWYb`K` ]bX`]b`XYf
K`Y]hYfV]`Xi b["8Yf`@UbX`fY]g`J`YW`hU`]bZcfa` ]Yfh`XUgg`X]Y
6fcgW0fY`Y]bY`VfY]hY`DU`YhY`Ub`?i fgYb`i bX`K` cf\_g\`cdg`V]YhYh
X]Y`gdYn]Y``Ui ZX]Y`6YX0fZb]ggY`j`cb': fUi Yb`ni [YgW`b]hYb`g]bX"

8]Y`?ccfX]b]Yfi b[gghY``Y` \Uh`g]W`ni a`N]Y``[YgYmh`z': fUi Yb`]b`XYf
FY[]cb`ni`i bhYfgh0hYb`z`gY]`Yg`ja`6YfY]W`XYf`K`Y]hYfV]`Xi b[ z`XYf
9l`]ghYbn[ f0bXi b[ `cXYf`XYg`VYfi Z]WYb`K`]YXYfY]bgh]Y[g`F`YbUhY
<]m`i bX`B`UbWm`A`Yb`_Y`z`X]Y`VY]XYb`j`YfUbhk`cfh`]WYb`5`\_hYi f]bbYb`z
VYhc`bYb`z`k`]Y`k`]W`h[ ]`Yg`]gh`z`XYb': fUi Yb`Y]bY`\_`UfY`Ghfi`_hi`f`ni
V]YhYb`" I`bgYfY`?i bX]bbYb`gc`Yb`Ui Zi b`\_ca`d`n]YfhY`K`Y]gY`XUg
Z0f`g]Y`dUggYbXY`5b[ YVch`ni`f`]bX]j`]Xi Y``Yb`VYfi Z]WYb
K`Y]hYfYb`hk` ]W`_i b[`Z]bXYb`_0bbYb` z`Yf`\_`Àfh`<]m"

⇒b \U`hY`XYg`bYi Yb`Dfc[fUa a`g

8 Ug`bYi Y`<YZh`]gh`j`c``[YdUW`\_h`a` ]h`5b[YVchYb`z`X]Y`b]W`h`bi`f`X]Y
_`Ugg]gWYb`6YfY]WY`k`]Y`98J`i`bX`F` \Yhcf]\_`UVXYW`\_Yb`z`gcbXYfb
Ui W`5gdY`_hY`k`]Y`X]Y`6U`UbW`nk` ]gWYb': Ua`]Y`i`bX`6Yfi Z]b`XYb
J`cfXYf[ fi bX`ghY``Yb`" K`]f`a` 0W`hYb': fUi Yb`b]W`h`bi`f`a`]h
hYW`b]gWYa` `K`]ggYb`j`Yfgcf[Yb`z`gcbXYfb`] \bYb`Ui W` \Y`ZYb`z`ja

cZha U`g`Y_h]gWkYb`5`hU[`X]Y`f]Wk h][Y`6U`UbW`ni`Z]bXYb`ž`gU[h
A Yb_Y`<]YfVY]`ghY`Yb`XYf`dYfg`b`WkY`Bi`hYb`i`bX`X]Y
J Yfa`]h`i`b[ `VYfi`ZgVYnc[ YbYb`K`]ggYbg`]a`A`]hY`di`b`h"

⊕`XYf`nk`Y]hYb`⊕\`fYg`Ā`ZhY`k`YfXYb`bYVYb`XYb`VYfY]hg`Y`hUV`]YfhYb
K`cf`g`cdg`Ui`Wk`]bX]j`]Xi`Y`Y`6YfUhi`b[`g[`Ygdf`ĀWkY`Ub[`YVchYb`"
8]YgYg`?`cbnYdh`n]Y`h`XUfUi`Z`UVž`XYb`:`fUi`Yb`X]Y`A`Ò[`]Wk`_Y]h`ni
[`YVYbž`X]fY`\_h`Ui`Z]\`fY`:`fU[`Yb`i`bX`6YX`ØfZb]ggY`Y]bni`[`Y`Yb`"⊕
Y]bYa`g]Wk`gh`ĀbX][`j`Yf`ĀbXYfbXYb`5fVY]hga`Uf`\_h]gh`Yg
YbhgWkY]XYbXž`XUgg`:`fUi`Yb`Ni`[`Ub[ `ni`⊕Zcfa`Uh]cbYb`i`bX
FYggci`fWk`b`\`UVYbž`X]Y`\`fY`VYfi`Z]WkY`9bhk`]W`_i`b[ `i`bhYfgh`ØhYb`"

:]bUb`n]Y`Y`i`b`hYfgh`Øhni`b[ `i`bX`6YfUhi`b[

9]b`k`Y]hYfYg`<][` \][` \h`ZØf`X]Y`HY]`bY`a`Yf]bbYb`]gh`X]Y
A`Ò[ `]Wk`\_Y]hž`Y]bYb`Ni`gWk`i`gg`ZØf`X]Y`?`i`fg[`YV`Ø`fYb`ni
VYUb`hfU[`Yb`":`ØfXYfVYfYWk h][`hY`:`fUi`Yb`\_`ØbbYb`V]g`ni`)`\$`Dfc`nYb`h
XYf`?`cghYbž`a`Ui`]a`U`Y`XcWk`(`\$\$`9i`fcž`ZØf`Y]bY`VYfi`Z]WkY`:`cf`h
i`bX`K`Y]hYfV]\`Xi`b[ `YfghUhhYh`VY`_ca`a`Yb`"8]Yg`gYb`\_h`X]Y
<Ya`a`gWk`k`Y`Y`ž`bYi`Y`?`i`fgY`ni`VY`Y[`Ybž`i`bX`Yf`ØZbYh`7`\`UbWk`b
ZØf`VYfi`Z]WkY`J`Yf`ĀbXYfi`b[`Yb`"

F`Yb`UhY`<]h`ni`bX`B`Ub`Wni`A`Yb`\_Y`g]bX`Ub`XYb`Gh`Ub`Xc`fhYb
7`c`dd`Yb`Vi`f[`ž`:`f]Ygc`m`\`Y`i`bX`J`YWk`hU`U`_h]j`ž`k`c`g]Y`]b`hYfYgg]YfhYb
:`fUi`Yb`]\`fY`9i`dYfh]gY`UbV]YhYb`i`bX`ZØf`:`fU[`Yb`fi`bX`i`a`XYb
VYfi`Z]WkYb`K`]YXYfY]bgh]Y[ `ni`f`J`YfZØ[`i`b[ `ghY`Yb`"8]YgY
I`bhYfgh`Øhni`b[ `]gh`YggYbn]Y`ž`i`a`:`fUi`Yb`]b`XYf`F`Y[ `]cb`Y]bYb
fY]Vi`b[`g`c`gYb`Ni`[`Ub[ `ni`a`5fVY]hga`Uf`_h`ni`Yfa`Ò[ `]WkYb`i`bX
]\`bYb`ni`Y`Z`Ybž`\`fY`?`ca`dYhYbnYb`Ui`gni`VUi`Yb`"

8`Ug`bYi`Y`Dfc[`fUa`a`Y`Zh]gh`Y]bY`k`Yfhj`c`Y`F`Yggci`fWk`ZØf`:`fUi`Ybž
X]Y`g]Wk`VYfi`Z]Wk`k`Y]hYfYb`hk`]W`_Y`b`c`XYf`bYi`c`f]Ybh]YfYb
a`ĀWk`hYb`"⊕`hYfYgg]YfhY`\_`ØbbYb`k`Y]hYfY`⊕Zcfa`Uh]cbYb`i`bX
8`YhU]`g`ni`XYb`5b[`YVchYb`Ui`Z`XYf`<`ca`YdU[`Y`i`bhYf
k`k`k`"\_`cc`fX]b]Yfi`b[`gghY`Y`ca`"XY`Z]bXYb`"

B`Yi`Y`DYfgdY`_h]j`Yb`ZØf`:`fUi`Yb`]a`6Yfi`Z

8 Ug'9b[U[Ya Ybh'XYf'?ccfX]b]Yfi b[gghY''Y': fUi Yb'i bX'K]fhgWUZh
]gh'Y]b'k]W h][Yf'GWf]hž'i a ': fUi Yb']b'XYf'FY[]cb'X]Y'A Ò[']W_X]h
ni '[YVYbž']\fY'DchYbn]U'Y'ni 'YbhZU'hYb''A]h'Y]bYa 'n]Y'[Yf]W hYhYb
5bgUhn'i bX'Y]bYa 'VfY]hYb'GdY_hfi a 'Ub'5b[YVchYb'nY][h'X]Y
'?ccfX]b]Yfi b[gghY''Yž'XUgg'g]Y'X]Y'<YfUi gZcfXYfi b[Ybž'j cf'XYbYb
j]Y'Y': fUi Yb'\Yi hni hU[Y'ghY\Ybž'Yfbgh'b]a a h''8]YgYg'Dfc[fUa a
_ÒbbhY'U'g'A cXY''ZØf'UbXYfY'FY[]cbYb'X]YbYbž'X]Y'À\b']W_Y
<YfUi gZcfXYfi b[Yb'VYk À'h][Yb'a ÒW hYb''

F Y`Yj Ubn`XYf`K Y]hYfV]`Xi b[`ZØf': fUi Yb

8]Y': ÒfXYfi b['j cb': fUi Yb']b'XYf'VYfi Z]W_Yb'K Y]hYfV]`Xi b[']gh
b]W h'bi f'j cb']bX]j]Xi Y''Yf'6YXYi hi b[ž'gcbXYfb'\Uh'Ui W
k Y]hfY]W_YbXY' [YgY''gWUZh]W_Y'`a d']\_Uh]cbYb''`đ'8Yi hgW`UbX
g]bX': fUi Yb'bUW`k]Y'j cf'i bhYffYdfÀgYbh]Yfh']b
: Ø\fi b[gdcg]h]cbYb'i bX'gdYn]Y''Yb': UW_VYfY]W_Ybž'k]Y'XYb'A `B H!
: ÀW_Yfb'fA Uh\Ya Uh]_ž'`đZcfa Uh]_ž'B Uhi fk]ggYbgWUZhYb'i bX
HYW_b]_ł'`@Ui h'XYa ': YbXYf': Ud'FYdcfh'&\$&&'XYg
K Y'hk]fhgWUZhgZcfi a g']gh'X]Y': YgW`YW hYfdUf]h'À'h' ]b'8Yi hgW`UbX
]b'XYb'6YfY]W_Yb'6]`Xi b[ ž'k ]fhgWUZh'i bX'Dc`h]_`bcW`Ub[Y'b]W h
YffY]W h''

9]b'k YgYbh]W_Yf'5gdY_h'XYf'K Y]hYfV]`Xi b[']gh'X]Y'A Ò[']W_X]h'ZØf
: fUi Ybž']\fY'VYfi Z]W_Yb'DYfgdY_h]j Yb'ni 'Yfk Y]hYfb'i bX'gca]h'ni f
GWUZI b['j cb'a Y\ f': 'Y]W_Y]h'Ua '5fVY]hgd`Uhn'VY]ni hfU[Yb''
Dfc[fUa a Y'k]Y' 5a '6U''V'Y]VYb 'V]YhYb'b]W h'bi f'X]Y
A Ò[']W_X]h'ni f'K Y]hYfV]`Xi b[ ž'gcbXYfb'ZØfXYfb'Ui W`XUg
GY'VghVYk i gghY]b'i bX'X]Y': À\][_Y]h'ni f'Y][Ybgh'ÀbX][Yb
'?Uff]YfY[YghU'hi b[''

5_hi Y`Y`GhUh]gh]_Yb`ni f`VYfi Z]W_Yb K Y]hYfV]`Xi b[

; Ya À» 'Y]bYf'Ghi X]Y'XYg'6i bXYga]b]ghYf]i a g'ZØf'6]`Xi b['i bX
: cfgW_i b['fbA 6: ł'Ui g'XYa 'đ\ f'&\$&%`bU\ a Yb' ]b'8Yi hgW`UbX
Yhk U'' \$'i 'XYf': fUi Yb'Ub'VYfi Z]W_Yf'K Y]hYfV]`Xi b['hY]ž'k À\ fYbX
XYf'5bhY]`VY]A ÀbbYfb'VY]Yhk U'(\$'i 'U[''8]YgYf'i bhYfgW]YX

j YfXYi h]W\h'XYb'bc W\ VYgh\YbXYb'6YXUfZ'Ub '[Yn]Y`hYb
Dfc[fUa a Yb'ZØf': fUi Yb''

8]Y'<Ø\Yfei U`Z]n]Yfi b['j cb': fUi Yb'hfÅ[h'b]W\h'bi f'ni f
dYfgØb`]W\Yb'9bhk ]W\_`i b['VY]ž'gcbXYfb'\Uh'Ui W\`d'cg]h]j Y
5i gk]f_`i b[ Yb'Ui Z'X]Y'K ]fhgW\UZh]bg[ YgUa h`'l bhYfbY\`a Ybž'X]Y
]b'X]Y'K Y]hYfV]'Xi b[']\fYf'A]hUfVY]hYf'bj Ygh]YfYbž'j YfnY]W\`bYb
\`Ai Z[ 'Y]bY'\Ø\YfY'A ]hUfVY]hYfni Zf]YXYb\`Y]hi bX'!V]bXi b["'@Ui h
Y]bYf'9f\`YVi b[ 'XYg'8Yi hgW\Yb'`bXi ghf]Y!'i bX
<UbXY`g\_Ua a YfhU[ Yg'fB ≈?L'[ UVYb'\* , 'i 'XYf'l bhYfbY\`a Yf'Ubž
XUgg'\`fY'A Åf\_hY'Xi fW\`VYggYf'Ui g[YV]'XYhY'A]hUfVY]hYf'fcVi ghYf
[Yk cfXYb'g]bX"

I bhYfghØhni b['Xi fW\`fY[ ]cbU`Y`B Yhnk Yf_Y

8]Y'?ccfX]b]Yfi b[gghY``Y': fUi Yb'`i bX'K ]fhgW\UZh]a `C`XYbVi f[Yf
A ØbghYf'UbX']gh'HY]'`Y]bYg'[fØ» YfYb'BYhnk Yf_Ygž'XUg'XUfUi Z
UVn]Y'hž': fUi Yb'`]b'XYf'F Y[ ]cb'VY]']\fYf'VYfi Z]W\Yb'9bhk ]W\_`i b[
ni `i bhYfghØhnyb''9]bY'J ]Y`nU\``Ub`C f[ Ub]gUh]cbYb'`i bX'`b]h]Uh]j Yb
ghY\`Yb'VYfY]hž'i a ``bZcfa Uh]cbYb'`i bX'F Yggci fW\`b
VYfY]hni ghY``Ybž'X]Y'ZØf'X]Y'VYfi Z]W\Y'BYi cf]Ybh]Yfi b['i bX
K Y]hYfV]'Xi b['j cb': fUi Yb'Yb'hgW\Y]XYbX'g]bX"

Ni gÅhn`]W\`ni `XYb'6YfUhi b[ gUb[ YVchYb'`i bX'K cf_g\cdg'ZØfXYfh
X]Y'?ccfX]b]Yfi b[gghY``Y'Ui W\`XYb'5i ghUi gW\`nk]gW\Yb': fUi Ybž
X]Y'À\`b`]W\Y'<YfUi gZcfXYfi b[Yb'Yf'YVYb''Gc`W\Y'BYhnk Yf_Y
_ØbbYb'U'g'k Yfhj c``Y'D`UhhZcfa Yb'X]YbYbž'i a `9fZU\`fi b[Yb
Ui gni hUi gW\Ybž'9fZc`[ g[ YgW\]W\hYb'ni `hY]'Yb'`i bX'[Y[YbgY]h][Y
I bhYfghØhni b['Ubni V]YhYbž'k Ug'ZØf'XYb'VYfi Z]W\Yb'5i Zgh]Y['i bX
X]Y'dYfgØb`]W\Y'9bhk ]W\_`i b['j cb'Yb'hgW\Y]XYbXYf'6YXYi hi b[']gh''

: Øf'k Y]hYfY'`bZcfa Uh]cbYb'ØVYf'X]Y'5b[ YVchY'`i bX'X]Y
i bhYfghØhnybXYb'Ghfi _hi fYb'`]b'XYf'F Y[ ]cb'`c\`bh'g]W\`Y]b'6`]W\_`Ui Z
X]Y'<ca YdU[Y'XYf'?ccfX]b]Yfi b[gghY``Y'`i bhYf'
k k k "_ccfX]b]Yfi b[gghY``Yca "XY"

6Ygi W\Yb`G]Y`i bg`Ui Z.`X]Y!bUW\ f]W\ hYb"bYh