

A Y[\ Ub`i bX`< Uffm`9`hYfbgW\ UZh`]a
X][]hU`Yb`NY]hU`hYf`i bX`] \ fY`Gcf[Yb

< Uffmi`i bX`A Y[\ Ub`gd fYW\ Yb`]b`Y]bYa`b`Yi`Yb
8cddY`]bhYfj`]Yk`ØVYf`ϕhYfbYh!< Ugg`i bX`XYb`GW\ i`h`n`] \ fYf
?]bXYf`"9]b`k`]W\ h][Yg`5b`]Y[Yb"

8]Y`< YfUi`gZcfXYfi`b[Yb`XYf`Cb`]bY!
G]W\ Yf\ Y]h`ZØf` : Ua`]`]Yb

⇒ X][]hU`Yb`NY]hU`hYf`k`]fX`XUg`H\ Ya`U`Cb`]bY!G]W\ Yf\ Y]h`ZØf
: Ua`]`]Yb`]a`a`Yf`k`]W\ h][Yf`"8]Yg`j`YfXYi`h`]W\ h`XUg` ; Ygd fÅW`j`cb
< Uffmi`i bX`A Y[\ Ub`ž`X]Y`gY]h`] \ fYf`< cW\ nY]h`]a`ϕ\ f`&\$%`]b
A`cbhYW]hcž`? U`]Zcfb]Ybž`YVYb`i`bX`9`hYfb`j`cb`nk`Y]`_`Y]bYb`?]bXYfb
g]bX"

8]Y`6YXYi`hi`b[`XYg`GW\ i`hnYg`j`cb`?]bXYfb

A Y[\ Ub`VYf]W\ hYh`]b`Y]bYa`ϕhYfj`]Yk`j`cb`XYf`J`YfU`bhk`cfhi`b[ž`X]Y
9`hYfb`\ UVYbž`i`a`]` \ fY`?]bXYf`ni`gW\ ØhnYb`"⇒ fY`HcW\ hYf`@`]VYh
i`bX`] \ f`Gc` \ b`5fW\]Y`g]bX`Yfgh`ZØb`Z`i`bX`XfY`]ϕ\ fY`U`h`"G]Y
VYgW\ fY]Vh`g]Y`U`g`i`b[`Ui`V`]W\ ž`k`Ug`nY][hž`k`]Y`j`]Y`@]YVY`g]Y`ZØf
] \ fY`?]bXYf`Ya`d]bXYh`"8cW\`X]Y`_`YW`_`Y` : fYi`XY`k`Y]W\ h`gW\ bY`
Yfbgh\ UZhYfYb`H\ Ya`Yb"

C b`]bY!< Ugg`U`g`k`UW\ gYbXY`6YXfc` \ i`b[

A Y[\ Ub`\ YVh`\ Yfj`cfž`XUgg`]a`ϕhYfbYh`j`]Y`Y`< YfUi`gZcfXYfi`b[Yb
VYghY\ Ybž`X]Y`Ui`Z`?]bXYf`i`bX` : Ua`]`]Yb`UVn]Y`Yb`"8]Y` ; YZU\ fYbž
X]Y`Xi`fW\ `Cb`]bY!< Ugg`i`bX`7mVYfa`cVV]b[`YbhghY\ Ybž`a`UW\ Yb`Yg
bchk`YbX][ž`XUgg`g]W\ `9`hYfb`i`bX`Ui`W\ `k`]XYf`] \ fY`?]bXYf`U`_`h]j` `a`]h

XYa`H\Ya`U`Ui`gY]bUbXYfgYhmYb"8Yf`K`i`bgW`j`cb`A`Y[\`Ubž`Y]bYb
dcg]hj`Yb`9]bZi`gg`ni`UVYbž`nY][`hig]W`j]b`]\fYa`6YghfYVYbž`HY]`
XYg`K`UbXY`g]b`XYf`X][`]hU`Yb`K`Y`h`ni`gY]b"

8]Y`F`c``Y`XYf`²`ZZYb`h`]W`_`Y]h`i`b`X`XYg
K`UbXY`g

<Uffmi`bX`A`Y[\`Ub`g]bX`g]W`j]\fYf`F`c``Y`U`g`ÖZZYb`h`]W`Y`DYfgcbYb
VYk`i`ggh`i`bX`Yf`_`Yb`bYbž`XUgg`g]Y`Xi`fW`j]\fY`D`UhhZcfa`Y]bYb
I`bhYfgW`j]YX`a`UW`Yb`_`ÖbbYb" `G]Y`a`ch]j`]YfYb`UbXYfY`9`hYfbž`g]W`
YVYbZU`g`ZØf`Y]bYb`g]W`YfYb`C`b`]bY!`F`Ui`a`Y]bni`gYhmYb" `Δ`fY
G]W`hk`Y]gY`]gh`VYgcbXYfg`k`]W`h][`ž`XU`g]Y`]b`XYf`²`ZZYb`h`]W`_`Y]h
ghY`Yb`i`bX`gca`]h`Y]bYb`X]fY`_`hYb`9]bZi`gg`Ui`Z`A`j``]cbYb`j`cb
A`YbgW`Yb`UVYb`_`ÖbbYb"

9]b`U`hi`b`[`X][`]hU`Yf`GhUbXUfXg

9g]gh`YbhgW`Y]XYbXž`XUgg`;`Ya`Y]bgW`UZh`Yb`ni`gUa`a`YbUfVY]hYbž
i`a`GhUbXUfXg`ZØf`X]Y`G]W`Yf`Y]h]a``ϕ`hYfbYh`ni`Y`hUV`]YfYb" `8]Y
8]g`_i`gg]cb`j`cb`<Uffmi`bX`A`Y[\`Ub`g]gh`Y]b`HY]`Y]bYg`VfY]hYfYb
HfYbXgž`XYf`X]Y`B`chk`YbX][`_`Y]h]j`YfXYi`h]W`hž`g]W`YfYfY`C`b`]bY!
I`a`[`YVi`b`[`Yb`ni`gW`UZZYb" `9`hYfb`_`ÖbbYb`b]W`h`bi`f`]\fY`Y][`YbYb
?]bXYf`gW`ØhYbž`gcbXYfb`Ui`W`Xi`fW`5i`Z`_`Äfi`b`[`i`bX
9b[`U[`Ya`Ybh`ni`f`G]W`Yf`Y]h`U`Yf`VY]hfU[`Yb"

:`Un]h.`;`Ya`Y]bgW`UZh`]W`Yf`9]bgUhn`ZØf
G]W`Yf`Y]h

8]Y`9fn]Y`i`b`[`j`cb`?]bXYfb`]a`X][`]hU`Yb`NY]hU`hYf`YfZcfXYfh`Y]bYb
U`_h]j`Yb`9]bgUhn`ZØf`]fY`G]W`Yf`Y]h]i`gck`c`\`c`ZZ]bY`U`g`Ui`W`
cb`]bY" `8]Y`ϕ]h]Uh]j`Y`j`cb`<Uffmi`bX`A`Y[\`Ubž`Y]bY`dcg]hj]`Y
J`Yf`ÄbXYfi`b`[`ni`VYk`]f`_`Ybž`]gh`Y]b`5i`Zfi`Z`Ub`U`Y`9`hYfbž`g]W`
ni`gUa`a`Ybni`gW`]Y»`Yb`i`bX`ZØf`Y]bY`g]W`YfY`X][`]hU`Y`Ni`_i`bZh`ni
_`Äa`dZYb"

8YhU]g

6Ygi W\Yb`G]Y`i bg`Ui Z.`b!U["XY