

; Yk U`hhUh`]a `GhfU» Ybj Yf\_Y`f. `Dc`]nY]  
gi W`h`NYi [ Yb`bUW`J cfZU``]b  
6cW\_Yb`Y]a

⊕: fUb\_Zi fh!6cW\_Yb`Y]a `Ua`Yg`ni`Y]bYa`j Yfgi W`hYb  
[ YZ`A`f`]W`Yb`, VYf[ f]Z]a`GhfU» Ybj Yf\_Y`f"NYi [ Yb`[ Ygi W`h`

5a`8]YbghU[ žXYb`&+"5i [ i gh&\$&( ž\UVYb`g]W`]a` : fUb\_Zi fhYf  
GhUXhhY`]6cW\_Yb`Y]a`YfgW`fYW\_YbXY`GnYbYb`UV[ Ygd]Y`h"; Y[ Yb  
%- .%) `I`f`Yg\_U`]YfhY`Y]b`GhfY]h`i`bhYf`J`Yf\_Y`fghY`]bY`a`Yfb`]b`XYf  
F`ÖXY`Y]a`Yf`GhfU» YžXYf`ØVYffUgW`YbX`[ Yk U`h`h`h][ `k`i`fXY`i`bX  
gc[ Uf`XYb`9]bgUhn`Y]bYg`A`YggYfg`VY]b`U`h`h`h`"8Yf`J`cfZU``žXYf  
g]W`]b`U``Yf`?`ZYb`h`]W`\_Y]h`YfY][`bYhY`ž`k`]fZh: fU[ Yb`ni`f`G]W`Yf`Y]h  
]a`GhfU» Ybj Yf\_Y`f`Ui`Zi`bX`U`h`XUg`⊕hYfYggY`XYf`9fa`]h`Yf  
[ Yk YW`h`

K ]Y`Ui`g`XYb`V]g`Yf][ Yb`9fa`]h`i`b[ Yb`Y`f]`cf[ Y`h`ž`k`Uf`Y]b  
( \$!`A`f][ Yf`A`Ubb`a`]h`gY]bYa` : U`fnYi [ `Ui`Z`XYf`F`ÖXY`Y]a`Yf  
GhfU» Y`i`bhYfk`Y[ gž`U`g`g]W`Y]bY`5i`gY]bUbXYfgYhni`b[ `a`]h`Y]bYa  
UbXYfYb` : U`fnYi [ ž]b`XYa`g]W`X`fY]`A`AbbYf`VYZUbXYbž`UbVU`b`hY"  
8]Y`[ YbUi`Yb`; fØbXY`ZØf`XYb`GhfY]h`g]bX`bcW`i`b`\_Ufž`XcW`XYf  
; YgW`ÅX][ hY`dfcj`cn]YfhY`c`ZYbVUf`X]Y`A`AbbYfž]bXYa`Yf`]bYb  
Y]bXYi`h][ Y`; YghYb`nY][ hY"8Yf`?`cbZ]\_h`Yg\_U`]YfhY`gW`bY`ž`U`g`XYf  
`+!`A`f][ Y`HUj`YfX`ÅW`h][ Y`ni`gUa`a`Yb`a`]h`Y]bYa`k`Y]hYfYbž  
V]g`Ub[ `i`bVY`Ub`b`h`b`?`ca`d`]nYb`XUg` : U`fnYi [ `j`Yf`]Y» `i`bX`Ui`Z  
XYb`; YgW`ÅX][ hYb`ni`[ ]b[ "

## 8 Yf`9]bgUhn`Y]bYg`A`YggYfg

⊕Y]bYf`XfUa`Uh]gW`Yb`K`YbXi`b[ `XYf`9fY][`b]ggY`nc[ `XYf  
`+!`A`f][ Y`Y]b`A`YggYf`Y`f]`cfž`XUg`Yf`Ub`Y]bYf`<`U`g`\_Y`hhY`hfi [ "9f  
ZØ`fhY`U[ [ fYgg]j`Y`Gh]W`VYk`Y[ i`b[ Yb`]b`F]W`hi`b[ `XYg

; YgWÅX][ hYb`Ui gž`XYf`g]WÅ`YXcWÅ`gWÅbY``b`F]WÅhi b[ `XYg  
6Y]ZU\fyfg]hnYg`Y\bhYž`i a`XYa`5b[ f]Z`ni`Ybh\_ca a Yb``8cWÅ  
XUa`]h`k Uf`X]Y; YZU\f`bcWÅ`b]WÅh[ YVUbbh`8Yf`nk Y]hY  
HUh] YfXÅWÅh][ Y`j Yfgi WÅhYž`XYb; YgWÅX][ hYb`a`]h: Ui ghgWÅ`À[ Yb  
ni`hfYZZYb"

8 Ug[ `ØW`]WÅY`9]b[ fY]ZYb`Y]bYg`Xf]hYb`ϕgUggYb`Ui g`XYa  
UbXYfYb: U\fnYi [ `gck`]Y`j cb`k Y]hYfYb`i bVYhY][ hYb`NYi [ Yb  
gcf[ hY`XUZØfž`XUgg`X]Y`5b[ fY]ZYf`j cb`\fYa`C dZYf`UV`]Y» Yb``8Yf  
`+!`Å\f][ Y`i bX`gY]bY`?ca`d`nYb`Zc\Yb`gWÅ`]Y»`]WÅ`]b`\f  
: U\fnYi [ ž`k`Å\fybX`XYf; YgWÅX][ hY`nk Uf`j Yf`Yhnhž`UVYf  
ni`a`]bXYgh`b]WÅh`gWÅk YfYf`j Yf`Yhnh`k`i`fXY"

8]Y`Dc`nY]`k`i`fXY`gWÅbY``U`Ufa`]Yfhi`bX`Y]bY: U\bXi`b[ `k`i`fXY  
Y]b[ Y`Y]hYh`6YUa`hY`\_cbbhYb`XUg`ZØWÅh][ Y: U\fnYi [ `]a`6YfY]WÅ  
XYf: f]YXYbgVfØW`Y`Ui`Z`U`hYb``8Yf`+!`Å\f][ Y`HUh] YfXÅWÅh][ Y  
k`i`fXY`ZYgh[ Ybca`a`Ybž`i`bX`Yg[ Y`Ub[ `XYb`9]bgUhn`f`ÅZhYbž`XUg  
j`Yfk`YbXYhY`A`YggYf`g]WÅYfni`ghY`Yb``B`UWÅ`XYf: YghbU\`a`Y`k`i`fXY  
Yf`]b`XUg`Dc`nY]df`Åg]X]i`a`: fUb`\_Z`fh[ YVfUWÅh`i`bX`k`]fX`]a`@Ui`ZY  
XYg`HU[ Yg`XYa`; Yf]WÅh]`cf[ YZØ\fh"

8Yf`⇒Yb]h]hÅh`XYg`nk`Y]hYb`HUh] YfXÅWÅh][ Ybž`XYf`VY`Y]X][ YbXY  
: Ui ghgWÅ`À[ Y`Ui`g[ YhY]`h`\UVYb`gc``ž`V`Y]Vh`V]g`Ub[ `i`b`\_`Uf"  
NYi [ YbVYgWÅfY]Vi`b[ Yb`ni`Zc`[ Y`\UbXY`h`Yg`g]WÅ`i`a`Y]bYb`A`Ubb  
]a`5`hYf`j`cb`Yhk`U`(\$`V]g`())`ϕ\fybž`Yf`]gh`\_cfdi`Yb`hž`Yhk`U`%`+\$  
WÅ`[ fc»`i`bX`\Uh`Y]bYb`8fY]!HU[ Y!6Ufh`6YgcbXYfg  
VYa`Yf`\_Ybgk`Yfh`]ghž`XUgg`Yf`a`]h`Y]bYa`c`ghYi`fcd`À]gWÅYb`5`\_nYbh  
gdfUWÅ`i`bX`VY]`XYa`J`cfZU``Y]bY`gWÅk`UfnY`GcbbYbVf]``Yž`Y]b`H!  
G\]fh`gck`]Y`Y]bY`\_i`fnY`gWÅk`UfnY`<cgY`hfi`[ "

## NYi [ YbUi Zfi Z

8]Y`Dc`nY]`f]WÅhYh`Y]bYb`Xf]b[ YbXYb`5i`Zfi`ZUb`X]Y`^`ZZYbh`]WÅ`\_Y]h"  
DYfgcbYbž`X]Y`ϕZcfa`Uh]cbYb`ni`X]YgYa`J`cfZU``VY]hfU[ Yb`\_`ØbbYbž  
k`YfXYb`[ YVYhYbž`g]WÅ`i`bhYf`XYf`HY`YZcbbi`a`a`Yf`\$`\*`-`#`+`)``%`%`\$`\$  
VY]a`ni`gh`ÅbX][ Yb`Dc`nY]fYj`]Yf`cXYf`Y`XYf`UbXYfYb  
Dc`nY]X]YbghghY`Y`ni`a`Y`XYb``8Yf`J`cfZU``nY][ h`b]WÅh`bi`f`X]Y  
dchYbn]Y`Yb; YZU\fyb`]a`GhfU»Ybj`Yf`\_Y\`fž`gcbXYfb`Ui`WÅž`k`]Y

gW`bY`?cbZ]\_hY`]b`; Yk U`hi a gW`U[ Yb`\_ÒbbYb"6YgcbXYfY  
5i Za Yf\_gUa \_Y]h[ ]`h`XUVY]`XYb`:`i W`hdYfgcbYbž`X]Y`bUW`XYf  
5i gY]bUbXYfgYhni b[ `]b`i bVY\_UbbhY`F]W`hi b[ `Ybhk ]gW`hYb"

8Yf`J cfZU``\UhX]Y`A YbgW`Yb`]b`:`fUb\_Zi fh`ghUf`\_VYk Y[ hž`i bX  
j ]Y`Y]W`hk ]fX`Yg`Ui W`Y]bY`8]g\_i gg]cb`XUfØVYf`Ubghc»Ybž`k ]Y  
gc`W`Y`?cbZ]\_hY`]b`Ni \_i bZij Yfa ]YXYb`k YfXYb`\_ÒbbYb"8]Y  
9fa ]hhi b[ Yb`[ Y`Yb`k Y]hYf`i bX`X]Y`Dc`nY]`ghY`h`]b`Yb[ Ya  
?cbhU`h`a ]h`NYi [ Ybž`i a `g`Aa h]W`Y`5gdY`hY`XYg`; YgW`Y`Ybg  
Ui Zni \_`ÀfYb" `G]W`Yf`]ghž`XUgg`; Yk U`hgnYbYb`]a `GhfU»Ybj Yf\_Y`f  
b]W`h`hc`Yf]Yfh`k YfXYb`XØfZYb"

8YhU]`g

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