

\* '8 ]b [ Yž'X]Y 'XYb 'bÅW ghYb '6 ]hWł ]b!  
6i ``Yba Uf\_h'Ui g`ÒgYb 'k YfXYb

6]hWł ]b ` \ Uh]b 'gY]bYf'fY`Uh]j ` \_i fnYb'; YgWł ]Wł hY 'nU\`fY]Wł Y  
< Ò\Yb 'i bX`H]YZb `Yf`YVhž`UVYf'bi f'k Yb][ Y'k i fXYb `U`g  
YWł hYf'6i ``Yba Uf\_h'VYnY]Wł bYh"8Yf`YhnhY 'k Uf`9bXY`&\$&%ž  
U`g`X]Y `?fmdhck Å\fi b [ `Ui Z]\fYb `bYi Yb`< ÒWł ghghUbX`j cb  
\* - "\$\$\$`I G!8c``Uf`gWł cgg"K Ug`XUfUi Z`Zc` [ hYž'k Uf`Y]b  
a Ugg]j Yf`DfY]gj YfZU``ž`XYf`XUni `ZØ\fhYž`XUgg`6H7`VY]  
a Y\fyfYb`Ni gUa a YbVfØWł Yb`]b`XYf`6fUbWł Y`gc k ]Y`Y]bYf  
[ U`cdd]YfYbXYb` [ `cVU`Yb` ðZUh]cb`i bX`Y]bYa `?f]Y [ `]b  
9i fcdU`V]g`i bhYf`&\$"\$\$\$\$`I G!8c``Uf`UVghØfnhY"8U`6]hWł ]b  
gY]h'gY]bYa `l bhYfZUb [ Yb`i bhYf`%\*"\$\$\$\$`I G!8c``Uf`XYi h`]Wł  
Ub`6cXYb` [ i h [ Ya UWł h` \Uhž`gdY`\_i `]Yfh`X]Y`7ca a i b]hm  
\Ài Z][ `XUfØVYfž`cV`Y]b`bYi Yf'6i ``Yba Uf\_h'VYfY]hg`VY [ cbbYb  
\Uh'cXYf`i ba ]hY`VUf`VYj c fghY`h" ð`X]YgYa ` / Ua d^Y``]d/



6]hWł ]b ` \ Uh]b 'gY]bYf'fY`Uh]j ` \_i fnYb'; YgWł ]Wł hY 'nU\`fY]Wł Y`< Ò\Yb  
i bX`H]YZb `Yf`YVhž`UVYf'bi f'k Yb][ Y'k i fXYb `U`g`YWł hYf  
6i ``Yba Uf\_h'VYnY]Wł bYh"8Yf`YhnhY 'k Uf`9bXY`&\$&%ž`U`g`X]Y  
?fmdhck Å\fi b [ `Ui Z]\fYb `bYi Yb`< ÒWł ghghUbX`j cb`\* - "\$\$\$`I G!  
8c``Uf`gWł cgg"

K Ug`XUfUi ZZc`[ hYžk Uf`Y]b`a Uggj Yf`DfY]gj YfZU`ž`XYf`XUni `ZØ\fhYž  
XUgg`6H7`VY]`a Y\fyfYb`Ni gUa a YbVfØWYb`]b`XYf`6fUbWY`gck ]Y  
Y]bYf`[ U`cdd]YfYbXYb`[ `cVU`Yb`ϕZUh]cb`i bX`Y]bYa `?f]Y[ `]b  
9i fcdU`V]g`i bhYf`&\$"\$\$\$`i G!8c``Uf`UVghØfnhY"

8U`6]hWc]b`gY]higY]bYa `I bhYfZUb[ Yb`i bhYf`%\*" "\$\$\$`i G!8c``Uf  
XYi h`]W`Ub`6cXYb`[ i h`[ Ya UW`h`Už`gdY`\_i `]Yfh`X]Y`7ca a i b]hm  
\Äi Z][ `XUfØVYfž`cV`Y]b`bYi Yf`6i ``Yba Uf`\_h`VYfY]hg`VY[ cbbYb`\Uh  
cXYf`i ba ]hhY`VUf`VYj cfghY`h`ϕ`X]YgYa `H\Ya U`k YfXYb`k ]f  
i bhYfgi WYbž`k Ug`XYf`? ϕ7\UhVch`7\Uh` DH`XUni `XYb`\_h`

## 5bbU\ a Y

CVk c`\`7\Uh` DH`VY]`6H7`Y]b`dUUf`8]b[ Y`ZU`gW`[ Ya UW`h`\Uhž`k ]Y  
ni a `6Y]gd]Y`XYb`5``nY]h\cW`dfY]gž``]YZYfhY`XYf`7\UhVch`Y]b][ Y  
]bhYfYggUbhY`9f`\_Yb`hb]ggY`XUfØVYfž`k Ug`XYb`bÅW`ghYb  
6i ``Yba Uf`\_h`j cfUbhfY]VYb`\_ÖbbhY`" ϕ`YfghYf`@]b]Y`k i fXY`X]Y  
[ `cVU`Y`5`\_nYdhUbn`\Yfj cf[ Y\cVYbž`X]Y`Ui g`nk Y]`HY]`Yb`VYghY`h`  
XYa `A Uf`\_h`i bX`XYa `]bgh]hi h]cbY`Yb` `i bX`k ]f`\UVYb`g]Y`ni  
Y]bYa `ni gUa a Yb[ YZUggh`

K Ug`X]Y`A Uf`\_h`U`\_nYdhUbn`VYhf]Zžž`[ Y`h`7\Uh` DH`XUj`cb`Ui gž`XUgg  
XYf`DfY]g`XYf`? fmdhc k À\fi b[ `gY]bYb`5i Zk ÅfhghfYbX`k ]YXYf  
Ui ZbY`a Yb`k ]fXž`gcVU`X`a Y`f`I bhYfbY`a Yb`VY[ ]bbYbž`g]Y`U`g  
NU\`i b[ ga Yh\cXY`ni `U`\_nYdh]YfYb`"8]Yg`k YfXY`XUni `VY]hfU[ Ybž`  
Y]bY`dcg]h] Y`Gh]a a i b[ `ni`gW`UZZYb`i bX`X]Y`B UW`ZFU[ Y  
Ubni`\_i fVY`b` "

: U`\_hc`fYb`k ]Y`X]Y`ϕhY[ fUh]cb`j`cb`6]hWc]b!NU\`i b[ gcdh]cbYb  
Xi fW`[ fc»Y`I bhYfbY`a Yb`cXYf`X]Y`9]bZØ\fi b[ `fY[ i `]YfhYf  
6]hWc]b!ϕj Ygha Ybhj Y`\\_Y``\_ÖbbYb`ni `Y]bYa `6i ``Yba Uf`\_h  
VY]hfU[ Yb`"

9]bY`]bgh]hi h]cbY`Y`9]bZØ\fi b[ `\_ÖbbhY`Ui W`XUni `VY]hfU[ Ybž`XYb  
DfY]g`j`cb`6H7`]b`X]Y`<Ø\Y`ni `hfY]VYb`"8Yb`\_Yb`G]Y`XUfUbž`XUgg  
nU\`fY]WY`:]fa Yb`k ]Y`A ]WfcGhfUhY[ mž`A UggA i hi U`ž`HYg`Už  
6`UW`\_F`cW`\_i bX`UbXYfY`k Å\fybX`XYg`YhnhYb`6i ``Yba Uf`\_h`g  
Yb`hk YXYf`HY]Y`XYg`JYfa Ö[ Yb`gk Yfhg`[ Y`\_Ui`Zh`cXYf`g]W`\_Ui`Z

UbXYfY`K`Y]gY`XUa` ]h`VYgW`ÅZh][`h`\UVYb"9]bY`K` ]YXYf\c`i`b[  
X]YgYg`GnYbUf]cg`\_`ÖbbhY`Y]bYb`k`Y]hYfYb`6i` ``Yb`Ui`Z`Ui`g`ÖgYb"

## HYW`bc`c`[ ]gW`Y`9b`hk` ]W`\_`i`b`[`Y`b`

8Yf`?`≠7`U`hV`ch`Vf`UW`hY`Ui`W`V`Y`gh]a`a`hY`hYW`b]gW`Y`  
9b`hk` ]W`\_`i`b`[`Y`b`ni`f`Gdf`UW`Y`ž`X]Y`Y]bYf`XYf`;`fØ`bXY`ZØf`Y]bYb`  
YfbYi`hYb`5bghi`fa`gY]b`\_`ÖbbhYb"6Y]gd]Y`gk`Y]gY`j`YfnY]W`bYhY`XUg`  
6]hW`c]b]BY`hmk`Yf`\_`bUW`X`Y`a`H`Uf`dc`ch]I`d[`f`UX`Y`Y]bY`ni`bY`a`YbXY`  
5\_nY`dh`Ubn`i`bX`Y]b`gh`Åf`\_`YfYg`9b[`U[`Ya`Yb`hž`k`Ug`X]Y`9f`ghY``i`b[  
j`cb`B:`Hg`X`Uf`ØV`Yf`\]bUi`g`Yfa`Ö[`\]W`hY"

8Uj`cb`d`f`c`Z]h]Yf`hYb`V]g\`Yf`j`cf`U``Ya`A` ]bYf`Ui`Z[`fi`bX`XYf`  
[`Y`gh]Y[`YbYb`5bnU`\`Ub`Hf`UbgU`\_h]cbYb`i`bX`XYf`\`Ö\`YfYb`  
;`YV`Ø\`fYb`\_c`ghYb"5``YfX]b[`g[`]Vh`Yg``Ui`h`7`U`h;`DH`Ui`W`U`bXYfY`  
:`U`\_`hc`fYb`i`bX`A`Ö[`\]W`\_`Y]hYb"

9f\`YV`]W`Y`:`cf`hg`W`f]h`hY`]b`XYf`ni`[`fi`bXY``]Y[`YbXYb`HYW`bc`c`[`Y`  
j`cb`6]hW`c]b`cXYf`J`YfV`Y`ggYfi`b[`Yb`XYf`G`\_U`]YfV`Uf`\_Y]hž`G]W`Yf\`Y]h`  
cXYf`8`UhY`bgW`i`hnZ`b`\_h]cbYb`\_`ÖbbYb`ZØf`5i`ZfY[`i`b[`]gc`f[`Yb`i`bX`  
a`Y\`f`6Ybi`hnYf`i`bX`≠j`Yghc`fYb`Ubn]Y\`Yb"

## F`Y`[`i`U`hc`f]gW`Y`?`U`f`\`Y]h`

C`V`k`c`\`a`Y\`fYfY`@`Å`bXYf`]b`XYb`Y`hnhYb`≠U\`fYb`Yf`ghY`J`Yf`gi`W`Y`  
i`bhYf`bca`a`Yb`\`UVYb`ž`X]Y`?`fmd`hck`Å\`fi`b[`gV`f`Ub`W`Y`ni`fY[`i`Y]YfYb`ž`  
V`Y]Vh`g]Y`bc`W`i]a`a`Yf`k`Y]h[`Y\`YbX`i`bV`Y`Ui`Zg]W`h][`h`H`U`hg`Å`W`]W`  
\`UVYb`Y]b][`Y`XYf`[`f`Ö»`hYb`B`U]cbYb`ž`k`Y]7`\]bU`i`bX`X]Y`I`G5`ž`X]Y`  
5b`U[`Y`\_`UggY`Yb`hk`YXYf`c`Z]n]Y``j`YfV`chYb`cXYf`Yg`Y]bZ`UW`  
j`Yfg`Å`i`a`hž`XY`hU]``]Yf`hY`J`cf`g`W`f]ZhYb`ni`Yf`UggYb`ž`X]Y`]\`f`ni`a`  
K`c`\`gh`UbX`j`Yf\`Y`ZYb`i`bX`[`\]W`nY]h][`X]Y`5b`Y[`Yf`g`W`Ø`hnYb`  
\_`ÖbbYb"

Gc``hY`g]W`X`Ug`YbX`]W`Å`bXYfb`ž`[`Y\`h`7`U`h;`DH`XUj`cb`Ui`gž`XUgg`  
XYf`DfY]g]j`cb`6`H7`k` ]YXYf`bUW`c`VYb`hYbX]YfYb`k`]fX"

?`UfY`i bX`[ Øbgh][ Y`J c f g W X f] ZhYb`\_ÒbbYb`Y]b`ghUV]`YfYg`i a ZY`X  
ZØf`? fmdhc k À\fi b[ Yb`gW UZZYb`i bX`XUg`J YfhfUi Yb`XYf`5b`Y[ Yf  
ghÀf`\_Yb`"Dc g]h]j Y`fY[ i`Uhc f]gW X Y`9b h k ]W`i b[ Yb`ž`k ]Y`X]Y  
5bYf`\_Ybbi b[ `j cb`6]hW`b`U`g`Y[ U`Y`NU`i b[ gZcfa`cXYf`X]Y  
9]b f]W hi b[ `i bhYfghØhnYbXYf`F U`a YbVYX]b[ i b[ Yb`ZØf  
? fmdhc k À\fi b[ gi bhYfbY`a Ybž`\_ÒbbYb`XUg`A Uf`hk UW`ghi a  
ZØfXYfb"

8]Y`G]hi Uh]cb`]b`XYb`i G5`k Uf`]b`XYb`YhnhYb`A cbUhYb`VYgcbXYfg  
gW`ÀX`]W`ž`XU`X]Y`G97`ž`c`bY`\_`UfY`F]W`h`]b]Yb`XUfØVYf  
VYfY]hni ghY`Ybž`k Y`W`Y`? fmdhc!5ggYhg`K YfhdUd]YfY`g]bXž`[ Y[ Yb  
I bhYfbY`a Yb`k ]Y`7c]bVUgYž`6]bUbWž`? fU`Yb`i bX`UbXYfY  
j cf[ Y[ Ub[ Yb`]gh"

## K ]fhgW UZh`]W X Y`i bX`[ Yc d c`]h]gW X Y` : U`hc f Y b

K ]Y`cVYb`Yfk À\bž`j Yfi fgUW`hY`XYf`]b`9i fcdU`Ui g[ YVfcW`YbY  
?f]Y[ `5b`Y[ Yfb`]b`j YfgW`]YXYbYb`GY`\_hc fYbž`Y]bgW`]Y»`]W`? fmdhcž  
GW`a YfnYb`"8 UfØVYf`]\]bUi g`ZØ`fhYb`X]Y`ghY][ YbXY`⊕ZUh]cb`i bX  
X]Y`j Yfnk Y]ZY`hYb`J Yfgi W`Y`XYf`NYbhfU`VUb`\_Ybž`g]Y`ni  
VY`\_Aa dZYbž`ni`5VZØggYb`Ui g`f]g]\_cVY`UZhYhYb  
J Yfa Ò[ Yb gk YfhYb`k ]Y`6H7"

5VYf`Ui ZY]bYf`Y`Yf`a U`\_fcÒ`\_cbca ]gW`Yb`9VYbY`[ `Ui Vh`7`U`h` DHž  
XUgg`X]Y`gW`Y`W`hY`K ]fhgW`UZh`U[ Yž`X]Y`K À\fi b[ gUVk Yfhi b[  
cXYf`X]Y`dc`]h]gW`Yb`i bfi`Yb`X]Y`A YbgW`Yb`XUni`Vf]b[ Yb  
\_ÒbbhYbž`g]W`6]hW`b`ni ni k YbXYb`"8 Ug`⊕hYfYggY`Ub`XYf  
df]a ÀfYb`? fmdhc k À\fi b[ `k ]fX`k U`fgW`Y]b`]W`ni bY`a Ybž`XU`X]Y  
A YbgW`Yb`bUW`X`YnYbhfU`Yb`i bX`b]W`h`ghUUh`]W`\_cbhfc`]YfhYb  
J Yfa Ò[ Yb gk YfhYb`k ]Y`6]hW`b`gi W`Yb`k YfXYb"

Y`b`]W`Y`9b h k ]W`i b[ Yb`gU`Yb`k ]f`]b`@AbXYfb`k ]Y`5f[ Ybh]b]Yb  
i bX`XYf`HØf`\_Y]ž`k c`X]Y`9]b`Y]a ]gW`Yb`gY]h`Y]b][ Yf`NY]h`a ]h`nk Y!  
i bX`gc[ Uf`XfY]ghY`][ Yb`⊕ZUh]cbgfUhYb`ni`\_Aa dZYb`UVYb`"8 U`Yf  
k ]YXYf`c`hY`7`U`h` DH`X]Y`K cfhY`XYg`Y[ YbXÀfYb`5`h]bj Yghc fg`DUi`  
Hi Xcf`⊗bYg`=

⊕`NY]hYb`k ]fhgW`UZh`]W`Yf`i bg]W`Yf`Y]h`VYhfUW`hYb`Y]b][ Y

5b`Y[ Yf'6]hWc]b'a Ò[ `]WXYfk Y]gY'U`g'5Vg]WXYfi b[ ' [ Y[ Yb  
hfUX]h]cbY`Y': ]bUbngmghYa Yžk Ug'a Ò[ `]WXYfk Y]gY'gY]bYb'DfY]g]b  
X]Y': < Ò\Y'hfY]Vh"

## 8 ]Y'6]hWc]b! < U`V]Yfi b[

Ni ' [ i hYf'@Yhnh'VfUWx hY'XYf'? ≠7\ UhVchi'X]Y' < U`V]Yfi b[ gYfY][ b]ggY  
ni f'GdfUWXY"G]Y'g]bX'gY]h'XYf'9]bZØ\fi b[ ' ]a' ð\ f'&\$\$- ' ]b'XUg  
6]hWc]b!BYhmk Yf\_] ]bhY[ f]Yfh'i bX'Z]bXYb'U`Y'&%\$"\$6`ÒW\_Y  
fi b[ YZÀ\ f'j ]Yf'ð\ fYŁ'ghUhh" N]Y'' ]gh'Ygž'X]Y'6`cW\_VY`c\bi b[ Yb'ni  
fYXi n]YfYb'i bX'gc'X]Y'; YgWk ]bX][ \_Y]h'ni 'j Yff]b[ Yfbž'a ]h'XYf  
bYi Y'6H7'YfghY`h'k YfXYb"

5i ZX]Y'j cf\Yf][ Yb'XfY]' < U`V]Yfi b[ Yb'Zc`[ hYb'a Ugg]j Y  
6i ``Yb`Ài ZYž'i bX'7\ Uh; DH'VY\Ui dhYhYž'XUgg'X]Y'bÀW ghY  
< U`V]Yfi b[ ' `X]Y'j cfUi gg]W h`]W `]a' 5df]'bÀW ghYb'ð\ fYg  
ghUhhZ]bXYb'k ]fX' 'k U\fgWXY]b`]W`ni `XYb'[ `Y]WXYb  
DfY]gVYk Y[ i b[ Yb'ZØ\ fYb'k ]fX"

⊕ XYf'J Yf[ Ub[ Yb\Y]h'Z]Y`Yb' < U`V]Yfi b[ gYfY][ b]ggY'a ]h  
6i ``Yba Àf\_hYb'ni gUa a Ybž'XU'g]W`Y]b'fYXi n]YfhYg'5b[ YVchi bX  
Y]b'dchYbn]Y`Yf'5bgh]Y[ `XYf'B UWx ZFU[ Y'dcg]hj' `Ui ZX]Yb'6]hWc]b!  
DfY]g'Ui g[ Yk ]f\_h'\UhYb"

K Ybb'G]Y'k Y]hYfY' ⊕ Zcfa Uh]cbYb'XUfØVYf'Yf\U'hYb'a ÒW hYbž'k Ug  
'Ui h'7\ Uh; DH'k À\ fYbX'i bX'bUWx `XYf'bÀW ghYb' < U`V]Yfi b[ 'a ]h  
6H7'dUgg]YfYb'k ]fXž`YgYb'G]Y'V]hY'X]YgYb'5fh]\_Y`"

I bX'k Ybb'hUhgÀW`]W`Y]b'bYi Yf'6i ``Ybnm\_`i g'Y]bhf]hž'gc``hYb'G]Y  
g]W`a ]h'X]YgYb'H]ddg'j cfVYfY]hYb"

...

6Ygi W\ Yb 'G]Y 'i bg 'Ui Z. '\_fmdhc!bYk g"Uh