

## 9]gVÅfYb!< Ua a Yf. 'Hfc hn'HYghgd]Y`! B ]YXYf`U[ Y`< c ZZbi b[ 'Ui Z`X]Y`GU]gcb

8]Y`<Ua a Yf'9]gVÅfYb`j Yf`]YfYb`]\f`YfghYg`HYghgd]Y`[ Y[ Yb  
H]`Vi f[ ž'nY][ Yb`YXcW`j ]Y`DchYbn]U`i bX`[ i hY`@Y]ghi b[ Yb`]b  
XYf`J cfVYfY]hi b[ "

8]Y`<Ua a Yf'9]gVÅfYb`UVYb`nk Uf`XUg`YfghY`HYghgd]Y`ni f  
J cfVYfY]hi b[ 'Ui Z`X]Y`bYi Y`GU]gcb`]b`XYf`CVYf`][ U`j Yf`cfYbž`XcW`  
X]Y`[ YnY][ hY`@Y]ghi b[ `gcf[ h`ZØf`C dh]a ]ga i g"8]Y`DUfh]Y`[ Y[ Yb`X]Y  
H]`Vi f[ `HfUddYfg`YbXYhY`a ]h`&. ( ž`XYbbcW`[ UV`Yg`j ]Y`Y`dcg]hj Y  
5gdY`hYž`X]Y`XUg`HYUa`a ch]j ]YfYb`XØfZhYb"

J cf`\*, \*`Ni gW`Ui Yfb`]b`XYf`9]g`U`Y`]b`K Yff]Yg`k UfYb`X]Y  
9]gVÅfYb`ni b`ÅW`gh[ YZcfXYfhž`XU`X]Y`<c``ÅbXYf`ghUf`\_VY[ UbbYbž  
UVYf`]b`XYb`YfghYb`nk Ubn][ `A ]bi hYb`\_Y]bY`HfYZZYf`Yfn]Y`Yb  
\_cbbhYb"8Ug`YfghY`8f]hhY`k Uf`j cb`Y]bYf`c`Yb`ϕhYbg]h`h  
[ Ydf`À[ hž`i bX`X]Y`9]gVÅfYb`gW`]YbYb`g]W`a ]h`Zcfh`Ui ZYbXYf  
Gd]Y`nY]h`ni bY`a YbX`Ubni dUggYb"≠fU`[a`K Y]»`YXYfž`XYf  
gdcfh]W`Y`@Y]hYf`XYg`HYUa`gž`k Uf`bUW`XYf`6Y[ Y[ bi b[ `VY[ Y]ghYfh  
j cb`XYf`Gd]Y`k Y]gY.`K ]f`UVYb`Y]b`gi dYf`<c`W`Ymgd]Y`[ YgY`Ybž  
]bXYa`Yg`fUi Zi bX`fi bhYf`[ ]b[ "K Ug`k ]`a Ub`a Y`f` 3

## 5i Z\c`^U[ X`XYf`9]gVÅfYb

⇒a`k Y]hYfYb`J Yf`Ui Z`XYf`6Y[ Y[ bi b[ `\_cbbhYb`X]Y`9]gVÅfYb`b]W`h  
bi f`X]Y`; `AghY`ja`; f]ZZ`VY`U`hYbž`gcbXYfb`nY][ hYb`Ui W`  
?Ua`dZ[ Y]gh`K`Å`fYbX`XYg`nk Y]hYb`8f]hhY`g`[ ]b[ `H]`Vi f[ `nk Uf`a ]h  
&.\$`]b`; Ø`fi b[ ž`XcW`XUg`Xf]hhY`8f]hhY`VfUW`hY`Y]bY`gdUbbYbXY  
K YbXY"BUW`XYa`X]Y`HfUddYfg`Ui Z`. \$`Yf`Ö`h`U`hYbž`[ UVYb`X]Y  
9]gVÅfYb`b]W`h`Ui Z`ž`]Ub`5]f]W`Yfn]Y`hY`XYb`YfghYb`HfYZZYf`ZØf  
gY]b`HYUa`i bX`gcf[ hY`ZØf`5i Zk ]bXž`[ YZc`[ h]j cb`Y]bYa`k Y]hYfYb

Hcf'XYg'B Yi ni [ Ub[ g'æcbUg'5'UbbY" '8]Yg'k Uf'VYgcbXYfg  
VYa Yf\_Ybgk Yfhž'XU'VY]XY'Gd]Y'Yf'bYi 'ja 'HYUa 'g]bX" '9g'jgh  
ja a Yf'gW'Òbž'k Ybb'X]Y'ž b[ g'hfYZZYbž'X]Y'bYi 'j]b'<Ua a 'g]bX ž  
Yf[ ÀbnhY'K Y]» 'YXYf'XUni "

Hfchn'X]YgYf'5i Zlc`U[ X'YbHgW]YX'HfU]bYf'7UgYmi: fUh\_]bž'\_i fn'j cf  
GW`i gg'XYb'Hcf\ØhYf'ni [ i bghYb'Y]bYg'ni gÀhn`]WYb'5b[ fY]ZYfg  
j ca '9]g'ni 'bY\ a Yb" '8]YgYf'ghfUhY[ ]gWY'GW UW ni [ 'ZØ\fhY  
'YXcW'XUni ž'XUgg'X]Y'HfUddYfg'XUg'Y'YfY'Hcf'XYf'9]gVÀfYb'hfUZYb  
i bX'XYb'9bXghUbX'j cb'(.&'VYg]Y[ Y'hYb": Øf'K Y]» 'YXYf'k Uf'Yg  
\_Uf.' K ]f'\UVYb'cZZYbg]j 'i bgYfY'7\UbW'b'b]W'h[ Ybi hnhž'UVYf  
hfchnXYa '[ i h[ Ygd]Y'h" '9f'g]Y'hj ]Y'DchYbn]U`j]b'XYf'A UbbgW UZh  
i bX'VYa Yf\_hž'XUgg'XUg'HYUa 'VYfY]hg'Yhnh'Y]bY'ghUf\_Y'; fi bXZcfa  
nY][ h"

5i gV`]W\_ 'Ui Z' \_ca a YbXY' < YfUi gZcfXYfi b[ Yb

8Yf'gdcfh]WY '@Y]hYf'Yfk ]Yg'g]W'U'g'cdh]a ]gh]gW'` \]bg]W'h]W'XYg  
; YgUa hdchYbn]U`g'XYg'HYUa gž'Yf'\_ÀfhY'UVYf'Ui W'ž'XUgg'X]Y  
A UbbgW UZh'Ub'j YfgW]YXYbYb'5gdY\_hYb'UfVY]hYb'a i gg" '8 Ug  
YfghY'J cfVYfY]hi b[ ggd]Y`\Uh'Y]b][ Y'\_Y]bYfY'6Ui ghY`Yb  
Ui Z[ YnY][ hž'Ub'XYbYb'k ]f'k Y]hYf'UfVY]hYb'a ØggYb" 'ž'XYf  
J cfVYfY]hi b[ '[ Y\h'Yg'XUfi a ž'g]W'ni 'Z]bXYb'i bX'X]Y'8]b[ Yž'X]Y  
k ]f'ja 'HfU]b]b[ '[ YØVh\UVYbž']bg'Gd]Y`ni 'Vf]b[ Yb"

5a '\_ca a YbXYb'K cWYbYbXY'ghY\Yb'ZØf'X]Y'<Ua a Yf'9]gVÀfYb  
k Y]hYfY'<YfUi gZcfXYfi b[ Yb'Ub" '8 Ug'HYUa 'fY]gh'bUW'GY'Vž'i a 'Ub  
Y]bYa 'Hi fb]Yf'hY]'ni bY\ a Yb" 'Ni bÀW'gh'hfYZZYb'X]Y'9]gVÀfYb'Ui Z  
X]Y'; Ugh[ YVYfž'X]Y'GY'VYf'K Ò'ZYž[ YZc'[ hj cb'Y]bYa 'a Ò[ `]WYb  
D'Uhn]Yfi b[ ggd]Y`[ Y[ Yb'XYb'8Y[ [ YbXcfZYf'G7'cXYf'XYb  
hgWYW]gWYb'J YfY]b'G'Uj ]U'DfU[ " '8 U'k UfhYb'Hcd!A UbbgW UZhYb  
Ui Zi bg" '9g'k ]fX'Y]b'\UfhYg'K cWYbYbXY' ž'gc'X]Y'9]bgW'Àhni b[  
j cb'K Y]» 'YXYf'ni 'XYb'VYj cfghY\YbXYb'6Y[ Y[ bi b[ Yb"

9]bXfi W\_ j cb'HYUa 'i bX '@Y]ghi b[

8]Y'9]gVÀfYb'\UVYb'j]b']fYf'YfghYb'HYghdUfh]Y'Y]b  
j ]Y'j YfgdfYWYbXYg'6]X'UV[ Y[ YVYb" 'I bUV\Àb[ ][ j ca '9f[ YVb]g

k i fXY`XYi h]Wk ž`XUgg`X]Y`A UbbgWk UZh`a ]h] ]Y`@]XYbgWk UZh`gd]Y`h"  
; Ya`Å»`9]bg]Wk hYb`j cb`≠fU\]a`K`Y]»`YXYf`]gh`XUg`HYUa`[ i`h`xfUi`Z  
i`bX`\Uh`XUg`DchYbn]U`ž`X]Y`<`YfUi`gZc`fXYfi`b[`Yb`XYf`b`Yi`Yb`GU]gcb  
YfZc`[`fY]Wk`ni`a`Y]ghYfb`"8`Ug`5i`[`Yba`Yf`\_]Y[`h`bi`b`Ui`Z`XYf`  
k`Y]hYfYb`J`YfVYggYfi`b[`i`bX`XYf`≠hY[`fUh]cb`XYf`B`Yi`ni`[`Åb[`Y`]b  
XYb`Gd]Y`Yfj`YfVi`bX`ž`i`a`]b`XYb`\_ca`a`YbXYb`K`YhhVYk`YfVYb  
cdh]a`U`Y`@]ghi`b[`Yb`ni`nY][`Yb`"

8]Y`<`Ua`a`Yf`9]gV`ÅfYb`\UVYb`]b`XYf`j`Yf[`Ub[`YbYb`GU]gcb`[`YnY][`hž  
XUgg`g]Y`]b`XYf`C`VYf`][`U`a`]h\`U`hYb`\_ÖbbYb`"8`Yf`J`YfY]b`\Uh`]b`XYb  
`Y`hnhYb`≠\`fYb`j`YfgWk]YXYbY`J`Yf`ÅbXYfi`b[`Yb`Xi`fWk`Ui`ZYb`ž`gck`c`\`  
]b`XYf`Gd]Y`Yf!`U`g`Ui`Wk`]b`XYf`HfU]bYfghfi`\_hi`f`"8]YgY  
5bdUggi`b[`Yb`g]bX`b`chk`YbX][`ž`i`a`a`]h`XYb`g]Wk`ghYh][  
j`Yf`ÅbXYfbXYb`HfYbXg`]a`9]g\`c`W`\_Ym`i`GWk`f]h`ni``\`U`hYb`"8`YbbcWk  
V`Y]Vh`XYf`J`YfY]b`]b`XYf`F`Y[`]cb`j`Yfk`i`fnY`h`i`bX`\`Uh`Y]bY`hfYi`Y  
5b\`Åb[`YfgWk`UZh`ž`X]Y`fY[`Y`a`Å]][`X]Y`<`Y]a`gd]Y`Y`VYgi`Wk`h`  
9]g\`c`W`\_Ym]b`<`Ua`a`]ghY`\`h`b]Wk`h`bi`f`ZØf`Gdc`fhž`gcbXYfb`Ui`Wk`ZØf  
;`Ya`Y]bgWk`UZh`i`bX`≠XYbh]h`Åh`"

## 8 Ug`9]g\`c`W`\_Ym]b`XYf`F`Y[`]cb

8]Y`F`Y[`]cb`i`a`<`Ua`a``\`Uh`Y]bY`Ub[`Y`HfUX]h]cb`]a`9]g\`c`W`\_Ymž  
i`bX`X]Y`<`Ua`a`Yf`9]gV`ÅfYb`g]bX`gY]h`≠\`fYb`Y]b`nYbhfU`Yf`  
6YghUbXhY]`X]YgYf`?`i`hi`f`"8`Yf`J`YfY]b`k`i`fXY`]a`≠\`f`%-`,\$  
[`Y[`fØbXYh`i`bX`\`Uh`gY]hXYa`a`Y`fYfY`<`Ö\`Yb`i`bX`H]YZYb`Yf`YVh`  
8]Yg`i`bhYfgWkY]XYh`g]Wk`j`cb`UbXYfYb`HYUa`g`]b`XYf`@[`Už`X]Y`c`Zh  
bYi`[`Y[`fØbXYh`k`YfXYb`c`XYf`g]Wk`]b`Z]bUbn]Y`Yb`GWk`k`]Yf][`\_Y]hYb  
VYZ]bXYb`"8]Y`9]gV`ÅfYb`\UVYb`g]Wk`Y`XcWk`YfZc`[`fY]Wk`VY\`Ui`dhYhž  
Ui`Wk`Xi`fWk`[`Yn]Y`hY`B`UWk`i`Wk`gUfVY]h`i`bX`X]Y`9bhk`]W`\_i`b[  
↑`b[`Yf`HU`Yb`hY`"

9bhk`]W`\_i`b[`i`bX`i`bhYfghØhmi`b[`XYg`J`YfY]bg`g]bX`b]Wk`h`bi`f`Ui`Z  
X]Y`Gd]Y`Yf`VYgWk`f`Åb`\_h`"5i`Wk`XUg`HfU]bYf`hYUa``\`Uh`Y]bYb  
k`YgYb`h]Wk`Yb`9]bZi`gg`Ui`Z`XYb`9fZc`[`XYf`A`UbbgWk`UZh`≠fU\]a  
K`Y]»`YXYf`ž`XYf`U`\_hi`Y`U`g`gdc`fh]Wk`Yf`@]hYf`Z`b[`]Yf`hž`gd]Y`h`Y]bY  
YbhgWkY]XYbXY`F`c`Y`VY]`XYf`HU`Yb`hZØfXYfi`b[`i`bX`XYf`  
`Ub[`Zf]gh][`Yb`GhfUhY[`]Y`XYg`J`YfY]bg`"F`Y[`Y`a`Å]][`Y`J`YfV]bXi`b[`ni`f  
`c`\_U`Yb`;`Ya`Y]bgWk`UZh`i`bX`XUg`9b[`U[`Ya`Ybh]b`gcn]U`Yb`Dfc`Y`\_hYb`"

j YfghÀf\_Yb`X]Y`6]bXi b[ `XYf` : Ubgi bX`XYf`ghÀXh]gWXYb  
6Yj Ò`\_Yfi b[ `Ub`XYb`J YfY]bž`k Ug`ZØf`Y]bYb`fY]Vi b[ g`cgYb  
J YfY]bgVYhf]YV`j cb`[ fc» Yf`6YXYi hi b[ `]gh"

## GhUh]gh]gWXY` , VYfg]W h`ni f`C VYf`][ U

8]Y`C VYf`][ Už]b`XYf`X]Y`9]gVÀfYb`gd]Y`Ybž]gh`X]Y`Xf]hh\ ÒW ghY  
9]g\cW\_Ym`][ U]b`8Yi hgW`UbX`i bX`i a ZUggh`%( `HYUa gž`X]Y`i a  
XYb`5i Zgh]Y[ `]b`X]Y`8 9@&\_Àa dZYb``8]Y`@Y]ghi b[ Yb`]b`X]YgYf`@[ U  
g]bX`Yb hgW`Y]XYbX`ZØf`X]Y`Ni \_i bZh`XYf`HYUa g``GhUh]gh]\_Yb`nY][ Ybž  
XUgg`a Y`f`U`g`+`\$`DfcnYbh`XYf`HYUa gž`X]Y`]\fY`Gd]Y`Yf`ghfUhY[ ]gW  
k Y]hYfYbhk ]W\_Y`bž]b`XYb`YhnhYb`š\`fYb`VYggYf`UV[ YgW`b]hhYb  
\UVYbž`k Ug`g]W`Ui W`]b`XYf`J Yf`Àb[ Yfi b[ `]\fYf`J YfhfÀ[ Y`a`]h  
Gd]Y`Yfb`k ]XYfgd]Y[ Y`h`Gc`W`Y`GhUh]gh]\_Yb`j YfXYi h]W`Ybž`k ]Y  
k ]W`h][ `Y]bY`gc`]XY`6Ug]g]b`XYf`š [ YbXZØfXYfi b[ `i bX`HYUa UfVY]h  
]ghž`i a `Ui Z`X]YgYf`9VYbY`YfZc`[ fY]W`ni`gY]b"

⇒`XYf`GU]gcb`&\$&`#&\$&(`\UVYb`X]Y`9]gVÀfYb`Y]bY`7\UbW`j cb  
fi bX`\*`\$`DfcnYbhž`g]W`ZØf`X]Y`D`Um`cZZg`ni`ei U`]Z]n]YfYbž`VUg]YfYbX  
Ui Z]\fYf`V]g\Yf][ Yb`@Y]ghi b[ `i bX`XYb`9]bgW`Àhni b[ Yb`j cb  
GdcfhYI dYfhYb``8]YgY`⇒Zcfa Uh]cbYb`g]bX`b]W`h`bi f`ZØf`X]Y` : Ubg  
j cb`⇒hYfYggYž`gcbXYfb`Ui W`ZØf`GdcbgcfYb`i bX`dchYbn]Y`Y  
BYi ni [ Àb[ Y"

8YhU]`g

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