

6H7`ghY][h'ØVYf`_i fnZf]gh][Yb
GW`ØggY`k]XYfghUbXž`9]bbU\`a Yb`j`cb
) "\$\$\$\$`I G83

6]hWc]b`U`h`X]Y`[`cVU`Yb`5_h]Yb`gc[Uf`]b`Y]bYa`f]g]_cUfa`Yb
I`a`Z`X`ØVYfhfcZZYbž`XU`X]Y`5b`Y[Yf`XUfUi`Z[Yk`UfhYh`\UVYbž`
cV`X]Y`I`bhYfghØhni`b[`VY]("\$\$\$\$`I G8`\U`hYb`k`ØfXY``8]Y
`Yi`h][Y`ghUf`_Y`F`U`mY`_ØbbhY`XYf`6Y[]bb`XYg`b`ÅW`ghY`b
5i`Zk`ÅfhghfY`bXg`ZØf`X]Y`df]a`ÅfY`?`fmdhck`Å`fi`b[`gY]bž`bUW
Y]bYf`Y]ba`cbUh][Yb`9fgW`ØhhYfi`b[`j`c`Yf`@]ei`]XUh]cbYb`i`bX
:`I`8ž`\Ui`dHg`ÅW`]W`Ui`g`7\]bU``K`]Y`k`]f`X]YgY`K`cW`Y
VYf]W`hY`hY`bž`nY][hY`XYf`(!Ghi`bXYb!7\Ufh`Y]bY`5VZUW`i`b[
XYf`_i`fnZf]gh][Yb`[`Y]hY`bXY`b`8i`fW`gW`b]hhY`ž`Y]b`NY]W`Yb
XU`ZØfž`XUgg`X]Y`?`cbgc`X]Yfi`b[`j`cfUbgW`fY]hY`h`i`bX
a`Ø[`]W`Yfk`Y]gY`Y]bYb`5i`gVfi`W`gj`Yfgi`W`j`cfVYfY]hY`h`6H7
YffY]W`hY`k`Y]hYf`\]b`\Ø`YfY`H]Y`Zghgh`Å`bXY`i`bX`VY[Ubbž`X]Y
ghY][YbXY`HfY`bX`]b]Y`VY](("\$\$\$\$`~`ni`hY`ghY`b" `#bYf`\U`V`j`cb
Ghi`bXYb`XfØW`hY`6H7`bUW`cVYb`i`bX`/`Ua`d`^`Y``]d/`

6]hWc]b`U`h`X]Y`[`cVU`Yb`5_h]Yb`gc[Uf`]b`Y]bYa`f]g]_cUfa`Yb
I`a`Z`X`ØVYfhfcZZYbž`XU`X]Y`5b`Y[Yf`XUfUi`Z[Yk`UfhYh`\UVYbž`cV
X]Y`I`bhYfghØhni`b[`VY]("\$\$\$\$`I G8`\U`hYb`k`ØfXY``8]Y`Yi`h][Y
ghUf`_Y`F`U`mY`_ØbbhY`XYf`6Y[]bb`XYg`b`ÅW`ghY`b`5i`Zk`ÅfhghfY`bXg
ZØf`X]Y`df]a`ÅfY`?`fmdhck`Å`fi`b[`gY]bž`bUW`Y]bYf`Y]ba`cbUh][Yb
9fgW`ØhhYfi`b[`j`c`Yf`@]ei`]XUh]cbYb`i`bX`I`8ž`\Ui`dHg`ÅW`]W`Ui`g
7\]bU"

K`]Y`k`]f`X]YgY`K`cW`Y`VYf]W`hY`hY`bž`nY][hY`XYf`(!Ghi`bXYb!7\Ufh
Y]bY`5VZUW`i`b[`XYf`_i`fnZf]gh][Yb`[`Y]hY`bXY`b`8i`fW`gW`b]hhY`ž`Y]b
NY]W`Yb`XU`ZØfž`XUgg`X]Y`?`cbgc`X]Yfi`b[`j`cfUbgW`fY]hY`h`i`bX
a`Ø[`]W`Yfk`Y]gY`Y]bYb`5i`gVfi`W`gj`Yfgi`W`j`cfVYfY]hY`h`

6H7`YffY]W`hY`k`Y]hYf`\]b`\Ø`YfY`H]Y`Zghgh`Å`bXY`i`bX`VY[Ubbž`X]Y

ghY][YbXY`HfYbX`]b]Y`VY](`("\$\$\$`~`ni`hYghYb" `#bYf\U`V`j`cb
Ghi`bXYb`XfØW_hY`6H7`bUW`cVYb`i`bX`hYghYhY`X]Y`bÅW`ghYb
k`]W`h][Yb`K`]XYfghUbXgb]j`YUi`g`VY](`(ž`\$\$\$\$`I`G8`i`bX`(`)ž%\$\$\$\$
I`G8`"

6H7'gh]Y[']b'X]Y' < Ò\Yž'U'g'G\cfhg'Ui'g']\fYb'Dcg]h]cbYb'[YdfYggh
k i fXYbž'U'g'i b['Ui V']WXY') ' - '6H7!G\cfhg']b'bi f'Y]bYf'A]bi hY
']ei]X]Yfh'k i fXYbž'k Ug'6H7'Ui Z' (+ "\$\$\$'I G8 'VfUW'hY" '5V'gcZcfh
YffY]W'hY'X]Y'FU'mY'j cb'6H7'Y]b' ðhfUXUm! < cW'j cb'ØVYf' (, "\$\$\$
I G8 'i bX'V]'XYhY'Y]b'\Ò\YfYg' < cW'ž'k Ug'k Y]hYf'XUfUi Z'\]bXYi hYhž
XUgg'K Y''Y'&'?cffY_hi f'k U\fgWXY]b']W'UV[YgW'cggYb"

K Ybb`XUg`\\Ò\YfY`H]YZ`VY]`~ (\$ž+`_`hUhg`ÀW`_]W`k`ÀfY`K`Y``Y`&ž`X]Y`
`Øb[ghY`DfY]gU_h]cb`ØVYf`(`) ž&_```XYi`hYh`XUfUi`Z`\]bž`XUgg`6H7`
Y]bghY][h`K`Y``Y```ž`k`Ug`X]Y`VYXYi`hYbXghY`5i`Zk`ÀfhgVYk`Y[i`b[`]gh`
5b[Yg]W`hg`XYf`HUhgUW`Yž`XUgg`X]YgY`9``]ch!K`Y``Yb`]a`J`Yf[`Y]W`
ni`XYb`[fÒ»`YfYb`K`Y``YbnU`\`Yb`_`Y]bYf`g]bXž`_`ÒbbhY`X]YgY`
5i`Zk`ÀfhgVYk`Y[i`b[`XYf`6Y[]bb`Y]bYg`ghUf`_`Yb`5i`Zk`Àfhg]a`di`gYg`
gY]bž`XYf`6H7`a`Ò[`]W`Yfk`Y]gY`ni`fØW`_]b`XYb`6YfY]W`XYg`
5``nY]h\c`W`g`gW`]W`h` `]ba`]hhYb`XYf`~`*) "\$\$\$!FY[]cb"

9g]gh'k]W h][ž'XYb' HU[YggW' i gg'fA]hYfbUW h'I H7Ł:UVni k UfhYbž
i a 'ni 'gY\Ybž'cV'XYf'6]hWc]b!DfY]g'X]Y'; Yk]bbY'\U'hYb'_Ubb"'9g
]gh'k]W h][ž'ØVYf'() "&"\$\$\$'i G8'ni 'gW'Y»Ybž'i a 'Y]b'\Ø\YfYg
<cW'ni 'V]'XYb"'Ni a 'NY]hdi b_h'XYg'GW'fY]VYbg'Y[h'6H7'Ui W
]bhfUXUm'ØVYf'XYa '['Y]hYbXYb'&\$\$!HU[Y!8i fW'gW'b]h'i bX'XYa
&%!K cWYb!9A 5ž'nk Y]'_f]h]gWY'B]j YUi g'VY]'XYf'6Ygh]a a i b['XYf
: cfhgYhni b['XYg'6i ``Yba Uf_hYg"

8Yb'&\$\$!HU[Y!['Y]hYbXYb'8i fW'gW'b]h'i bX'XYb'&%!K cWYb!9A 5
Ui Zk ØWYbh]WYf'GW' i ggVUg]g'ni fØW'ni YfcVYfbž']gh'Y]b'gY\ f
n]bgVi ``]gWYg'G][bU"

C b!7\U]b'k Uf'Vi ``]gW'VY]'(\$ž+_~

5`g': I 8' i bX'F]g_!C ZZ'XYb'A Uf_h'YfgW'ØhYfhYbž'nY][hYb'X]Y'6H7!
C b!7\U]b!A Yhf]_Yb'k Y]hYf\]b'Y]bYb'ghUf_Yb'5i Zk ÅfhghfYbX"
K Å\fybX'XYg'[YgUa hYb'F ØW_[Ub[gj'cb')) i 'ja 'A U]\UVYb'g]W
Ub\U'hYbXY'@]ei]XUh]cbgYfY][b]ggY'i bX': I 8ž'X]Y''Ub[Zf]gh][Yb
ϕ\UVYf'i bX'A]bYfž'k Y]hYf'Ub[YgUa a Y'h''8]YgYg'J Yf\U'hYb
Ybhgd]f]W h'ZfØ\YfYb'6]hWc]b!<Ui ggYba Åf_hYbž']bgVYgcbXYfY'XYa
<Ui ggYba Uf_hj'cb'&\$%' ž'k c'g]W'Ub[Zf]gh][Y'ϕ\UVYf'i bX'A]bYf
k Y]hYf'Ub\Ài ZhYb"

æ ; Y[YbgUhnini '6ÅfYba Åf_hYbž'Ub'XYbYb''Ub[Zf]gh)[Y'æ\UVYf
i bX'A]bYf'bUW' dUfUVc`]gWYb'6`ck !cZlGd]hnYb'i bX'6i''YbZU''Yb
U[[fYgg]j 'j YfhY]'Ybž'ZØ\fhY'XYf'X]Yg'Å\][Y'5Vghi fn'j cb')) i 'ja
A U]'b]W'h'ni 'Y]bYf'k Y]hYfYb'J YfhY]'i b['Xi fW'X]YgY'?c\cfhYb"
8]YgYf'HfYbX'k]XYf'Y[h'X]Y'6ÅfYb'h\YgY'Y]bXYi h][ž'XU'U''Y
6ÅfYba Åf_hY'Y]bY'U[[fYgg]j Y'J YfhY]'i b['j cb''Ub[Zf]gh)[Yb
æ\UVYfb'i bX'6Yf['Yi hYb'gU\Yb"

æ'XYb''YmhYb'HU[Yb'hYbX]YfhYb'X]Y'8Yj]gYb_UggUfYgYfj Yb
k Y]hYf'bUW' i bhYbž'cVkc\`X]Y' [`cVU'Yb'A Åf_hY'Ui gj Yf_Ui Zh
k UfYb'i bX'XYf'8c''Uf'g]W'Yf\c'hY''8]Y'I HLC!5'hYfgj YfhY]'i b['j cb
7fmdhcE i Ub'h'nY][hYž'XUgg'g]W'Øb[YfY'A ØbnYb'k Y]hYf
j Yf_Ui ZhYbž'k Å\fYbX'g]W'X]Y'Å'hYfYb'A ØbnYb'Ub\Åi ZhYb''8]Y
GdchVØfgYb'g]bX'k Å\fYbX'XYg' !k ØW][Yb'Di ''VUW_g'i a 'a Y\f'U`g
) "\$\$\$'6H7 '[YZU''Ybž'Y]b'ghUf_Yg'G][bU''ZØf'Y]bY'5__i a i 'Uh]cb"

9]b[Y\YbXYf`Vi ``]gW\ Yf`GW\ f]hh3

A]h_i fnZf]gh][Yb`hYW\ b]gW\ Yb`8 UhYbž`X]Y`Y]bY`XYi h]W\ Y
J YfVYggYfi b[`nY][Ybž`Y]bYa `ZYgh`n]bgVi ``]gW\ Yb`C b!7\U]b!HfYbX
i bX`Y]bYf`5V k Y]W\ i b[`j cb`XYb`[`cVU`Yb`5_h]Ybž`gW\ Y]bh`6H7`[i h
dcg]h]cb]Yfh`ZØf`Y]bYb`g][b]Z]_UbhYb`5i Zk`ÀfhghfYbXž`k Ybb`k]f
k Y]hYf\]b`Y]bY`VYhf`ÀW\ h]W\ Y`5__i a i`Uh]cb`i bX`Y]bY
DfY]gbUW\ Zc`[Y`bUW\ `cVYb`gY\Yb`

⇒ a `A ca Ybh`\UVYb`X]Y`6i ``Yb`k]YXYf`X]Y`?cbhfc``Y
ni fØW_[Yk cbbYb``8Yf`K cW\ YbgW\ `i gg`k]fX`X]Y`Øb[ghY
5i Zk`ÀfhgVYk Y[i b[`k Y]hYf`VYgh`Àh][Yb``5``Y`5i [Yb`k YfXYb`Ui Z
~ () ž&_[Yf]W\ hYh`gY]bž`i a `Y]b`\Ø\YfYg`<cW\ `ni `VYgh`Àh][Yb`

...

8YhU]`g

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