

F Yj c`i h]cb`]a` < Ui g\U`h. `8 fYUa Y` < %( `Dfc  
j YfY]bZUW\h`X]Y`F Y]b][ i b[ `]b`6Yf`]b

9bhXYW\_Yb`G]Y`XYb`8 fYUa Y` < %( `Dfc. `9]b`fYj c`i h]cb`fYf  
B Ugg!`i bX`Hfc\_W\_YbgUi [ Yf`a`]h`%, \$!; fUX!: `UW\XYg][ bž  
Ui hca Uh]gW\Yf`@Øgi b[ ga`]hhY`!8cg]Yfi b[ `i bX`Y]bYf  
VYY]bXfi W\_YbXYb`5\_\_i`!@Ui ZnY]hj cb`(\$`A`]bi hYb`"×YU`ZØf  
a Ø\Y`cgYg`K`]gW\Yb`i bX`GUi [ Yb`gY`Vgh]b`gW\k Yf  
YffY]W\UfYb`6YfY]W\Yb`"9fZU\fyb`G]Y`a`Y\`f`ØVYf`gY]bY  
]bbcj Uh]j Yb`:`i b\_h]cbYb`i bX`ghUfhYb`G]Y`gUi VYf`]b`XYb  
5`hU[`°



8 fYUa Y` < %( `Dfc. `F Yj c`i h]cb`fY  
F Y]b][ i b[ ghYW\bc`c[ ]Y`ZØf`a`cXYfbY  
< Ui g\U`hY

8]Y`9]bZØ\fi b[ `XYg`bYi Yb`B Ugg!`i bX`Hfc\_W\_YbgUi [ Yfg`< %( `Dfc  
Xi fW`8 fYUa Y`HYW\bc`c[ m]Ua`\$`"GYdhYa VYf`&\$&( `a Uf\_]Yfh  
Y]bYb`YbhgW\Y]XYbXYb`GW\f]h]b`XYf`9bhk ]W`i b[ `ga UfhYf  
< Ui g\U`hg[ Yf`hY`"8 Ug]b`6Yf`]b`Ubg`Ägg][ Y`i bhYfbY`a`Ybž`XUg  
&\$%+`[ Y[ fØbXYh`k`i`fXYž`\Uh`g]W\`U`g`≠bcj Uhc`f`ZØf`]bhY`][ YbhY  
F Y]b][ i b[ g!`i bX`< Ui g\U`hg`Øgi b[ Yb`YhUV`]Yfh`"A`]h`XYa` < %( `Dfc  
k ]fX`Y]b`DfcXi`\_hj`cf[ YghY`hž`XUg`b]W\h`bi`f`X]Y

F Y]b][[ i b[ g`Y]ghi b[ `cdh]a ]Yfhž`gcbXYfb`Ui W`XYb`5`hU[ `XYf  
Bi hnYf`Yf\YV`]W`Yf`Y]W`hYfh"

9]b`nYbhfU`Yg`A Yf\_a U`XYg`<%( `Dfc`]gh`gY]b`%, \$!; fUX!  
: `UWXYg][ bž`XUg`Yg`Yfa Ò[ `]W`hž`gY`Vgh`gW`k Yf`YffY]W`VUfY  
6YfY]W`Y`k ]Y`XYb`D`Um`i bhYf`A ÒVY`b`a Ø\Y`cg`ni `fY]b][ Yb`"8]YgY  
: i b\_h]cb`gdf]W`h`]bgVYgcbXYfY`J YfVfUi W`Yf`Ubž`X]Y`cZh`a ]h  
\Ufhb`ÅW\_] [ Ya `GW`a i hn`\_cbZfcbh]Yfh`g]bXž`XYf`g]W`Ub  
i bni [ `Åb[ `]W`Yb`C`fhYb`UbgUa`a`Y`h`"@Ui`h`GYUb`7`Ybž  
; YbYfU`X]fY`hcf`j`cb`8fYUa`Y`ZØf`GØX`!`i`bX`K`YghY`i`fcdUž`]gh`Yg`XUg  
N]Y`XYg`i`bhYfbY`a`Ybgž`a`]h`ZcfhgW`f]hh]W`Yf`HYW`bc`c[ ]Y`XUg  
@YVYb`XYf`Bi`hnYf`ni`j`YfVYggYfb`i`bX`]fY`F`Y]b][ i b[ gUi`Z[ UVYb`ni  
fYj`c`i`h]cb]YfYb"

⇒b bcj Uh]j Y`F`Y]b][[ i b[ ghYW`bc`c[ ]Y`]a

9]bgUhn

8Yf`<%( `Dfc`]gh`a`]h`Y]bYa`<cW`[ YgW`k`]bX][ `\_Y]hga`chcf  
Ui`g[ YghUhhYhž`XYf`Y]bY`VYY]bXfi`W`YbXY`8fY`nU`a`j`cb`%("\$\$\$  
F`DA`YffY]W`h`"8]YgY`\c`Y`; YgW`k`]bX][ `\_Y]h`Yfa`Ò[ `]W`h`Y]bY  
[ fØb`X`]W`Yž`ghfY]ZYbZfY]Y`F`Y]b][[ i b[ `i`bX`YbhZYfb`h`gY`Vgh  
\Ufhb`ÅW\_] [ Y`²`Y`]bbYf`U`V`j`cb`bi`f`k`Yb][ Yb`A`]bi`hYb`"Ni`XYa  
\_ca`a`h`Y]bY`XcddY`h`fch]YfYbXY`6ØfghY`ni`a`9]bgUhnž`X]Y`Y]bY  
JYfk]ffib[ `j`cb`<UUfYb`j`Yf`]bXYfhi`bX`X]Y`F`Y]b][[ i b[ `YZZ]n]YbhYf  
[ YghU`h`Yh`"B`UW`X`Y`a`9]bgUhn`gcf[ `h`Y]bY`]bhY[ `f]YfhY  
HfcW`\_bi`b[ gZ`b\_h]cb`XUZØfž`XUgg`X]Y`6ØfghY`\m[ ]Yb]gW`Zf]gW  
V`Y]Vh`i`bX`i`bUb[ YbY`a`Y`; YfØW`Y`j`Yfa`]YXYb`k`YfXYb"

⇒bhY``][ YbhY`:` i b\_h]cbYb`i`bX`Y]bZUW`Y

6YX]Ybi`b[

9]b`5`Y]bghY`i`b[ ga`Yf\_a U`XYg`<%( `Dfc`]gh`X]Y`Ui`hca`Uh]gW`Y  
8cg]Yfi`b[ `XYf`F`Y]b][[ i b[ g`Øgi`b[ `"8`Ug`; Yf`Å`h`Yf`\_Ybbh  
gY`Vghgh`Å`bX][ `XYb`F`Y]b][[ i b[ gVYXUFZi`bX`dUggh`X]Y`A`Yb[ Y`XYf  
j`Yfk`YbXYhYb`@Øgi`b[ `Ub`Y`Y]bY`Yf`YV`]W`Y`9f`Y]W`hYfi`b[ `ZØf`X]Y  
Bi`hnYf`"Ni`g`Å`h`]W`Yfa`Ò[ `]W`h`X]Y`ni`[ Y`\Øf][ Y`8fYUa`Y`ca`Y!5dd  
X]Y`]bX]j`]Xi`Y`Y`5bdUggi`b[ `XYf`F`Y]b][[ i b[ gdUfUa`YhYfž`gcXUgg

YXYf'6Ybi hnYf'gY]bYb'dYfgOb`]WXYb'F Y]b][ i b[ gdfcnYgg'ghYi Yfb  
\_Ubb"

8]Y'6Ybi hnYfZfYi bX`]W\_X]h'k i fXY'k Y]hYf'Xi fW\_X]b']bbcj Uh]j Yg  
;`]XYK \YY'fHA Ě'Dck Yf'GmgHYa 'Yf\Ò\hž'XUg'X]Y'<UbX\UVi b[ 'XYg  
; YfÀhYg'Yf'Y]W\_X]hYf'h"9]b']bhY[ f]YfhYg'@98!8]gd'Umi bX  
GdfUW\_X]hYi Yfi b[ gZ b\_h]cbYb'fi bXYb'XUg'a cXYfbY  
Bi hni b[ gYf'YVb]g'XYg'<%( 'Dfc'UV"8]YgY': i b\_h]cbYb'a UW\_X]b'Yg  
ZØf'j ]Y'Y'A YbgW\_X]b'Y]bZUW\_X]fž'\fYb'<Ui g\U'h'ni 'cf[ Ub]g]YfYb  
i bX'ZØf'GUi VYf\_Y]h'ni 'gcf[ Yb"

5i gk ]f\_ i b[ Yb'Ui Z'XYb '@YVYbggh]'`XYf  
J YfVfUi W\_X]f

8]Y'9]bZØ\fi b[ 'XYg'<%( 'Dfc'gd]Y[ Y'h'Y]bY'VfY]hYfY  
[ YgY`gW\_X]h]W\_X]hYbXYbn'k ]XYf.'a a Yf'a Y\f'A YbgW\_X]b''Y[ Yb  
K Yfh'Ui Z'9Z]h]Ybn'i bX'HYW\_X]bc`c[ ]Y']a '5`hU[ "8i fW\_X]a cXYfbghY  
HYW\_X]bc`c[ ]Yb']b'<Ui g\U'hg[ YfÀhYb'k ]fX'b]W\_X]h'bi f'NY]h[ YgdUfhž  
gcbXYfb'Ui W\_X]Y'@YVYbgei U']hÀh'XYf'Bi hnYf'[ YghY][ Yfh"8U'X]Y  
A YbgW\_X]b'ni bY\ a YbX' ]b'\Y\_h]gW\_X]b'@YVYbgi a ghÀbXYb''YVYbž  
k ]fX'X]Y': À\[\_Y]hž'F Y]b][ i b[ gUi Z[ UVYb'gW\_X]bY''i bX'[ fØbX`]W\_X]ni  
Yf'YX][ Ybž]a a Yf'k ]W\_X]h][ Yf"

DfY]gY' i bX' J YfZØ[ VUf\_Y]h

8Yf'<%( 'Dfc']gh'UV'XYa '\$\*"GYdhYa VYf'&\$&('ni 'Y]bYa  
Ya dZc\`YbYb'J Yf\_Ui ZgdfY]g'j cb'\* - - '9i fc'j YfZØ[VUf"i a 'XYb  
J Yf\_Ui ZgghUfh'ni 'ZY]Yfbž'V]YhYh'8fYUa Y'Y]bYb'F UVUhh]j cb'%%\$ \$  
9i fc'Ubž'k Ug'X]Y'5\_ei ]g]h]cb'XYg'; YfÀhYg'ZØf'j ]Y'Y'<Ui g\U'hY  
UhhfU\_h]j Yf'a UW\_X]h"8i fW\_X]Y'Yf\Ò\hY'@Y]ghi b[ 'i bX'X]Y  
VYbi hnYfZfYi bX`]W\_X]b': i b\_h]cbYb'ghY''h'XYf'<%( 'Dfc'Y]bY  
k Yfh]c`Y'`b] Ygh]h]cb']b'X]Y'<Ui g\U'hgZØ\fi b[ 'XUf"

Ni gUa a YbZUggYbX`Àggh'g]W\_X]gU[ Ybž'XUgg'XYf'8fYUa Y'<%( 'Dfc  
b]W\_X]h'bi f'Y]b'k Y]hYfYg'F Y]b][ i b[ g[ YfÀh']ghž'gcbXYfb'Y]b'GW\_X]f]h']b  
X]Y'Ni \_i bZ'h'XYf']bhY''[ YbhYb'<Ui g\U'hgZØ\fi b[ "'GY]bY  
@Y]ghi b[ gZÀ\][ \_Y]h'i bX'X]Y'`bhY[ fUh]cb'a cXYfbghYf'HYW\_X]bc`c[ ]Y

\_ÖbbhYb`X]Y`5fhi bX`K Y]gYž`k ]Y`<Ui g\U`hY`[ YZØ\fh`k YfXYbž  
fYj c`i h]cb]YfYb"

K Y]hYfY`ϕZcfa Uh]cbYb`ni `8fYUa Y`i bX`gY]bYb`DfcXi \_hYb`Z]bXYb  
G]Y`Ui ZXYf`cZ]n]Y`Yb`K YVg]hY`i bX`]b`XYb`gcn]U`Yb`A YX]Yb"

8YhU]`g

6Ygi W\Yb`G]Y`i bg`Ui Z.`a Y]b!VYf`]b"bYh