

9bYfhfU[ . : ÒfXYfa ]hhY`ZØf  
K UggYfghc ZZdfc ^Y\_hY`]b`6fUbXYbVi f[ `i bX  
A J

9bYfhfU[ !J c fghUbX`HcV]Ug`6]gWk cZlB ]Ya n`gdf]Wk h`ØVYf`[ fc» Y  
9`Y\_hfc`mgY!Dfc ^Y\_hY`]b`6fUbXYbVi f[ `i bX`A YW`YbVi f[ !  
J cfdca a Yfb`ni f`K UggYfghc ZZdfcXi \_h]cb"

⇒a `<YfnYb`XYf`l W\_Yfa Uf`\_Yb[ U[ ]Yfhig]Wk`XUg`l bhYfbY\`a Yb  
9bYfhfU[ `gY]h`ØVYf`Y]bYa `»\fnY\`bh ZØf`X]Y`bUWk`U`h][ Y  
9fnYi [ i b[ `j cb`K UggYfghc ZZ`Xi fWk`K ]bXYbYf[ ]Y"5\_hi Y`nA`h`XUg  
l bhYfbY\`a Yb`a Y`f`U`g`%\$\$\$`A ]hUfVY]hYf`i bX`]gh`]bhYfbUh]cbU`  
h`h][ žk Ug`X]Y`6YXYi hi b[ `XYf`XYi hgWk Yb`≠bcj Uh]cbg\_fUZh`ja  
6YfY]Wk`YfbYi YfVUfY`9bYf[ ]Yb`i bhYfghfY]Wk`h"J c fghUbXga ]h[ `]YX  
HcV]Ug`6]gWk cZlB ]Ya n`\Uh`\_Øfn`]Wk`ØVYf`X]Y`bYi YghYb  
9bhk ]W`i b[ Yb`XYg`l bhYfbY\`a Ybg`i bX`XYfYb`9]bZi gg`Ui Z`X]Y  
K UggYfghc Zk ]fhgWk UZh[ YgdfcWk Yb"

9]bY`VYgcbXYfY` : fYi XY`VYfY]hYh`XYa `9bYfhfU[ !J c fghUbX`XYf  
`Øb[ ghY` : ÒfXYfVYgWk Y]X`XYf`6i bXYgfY[ ]Yfi b[ " `@Ui h`6]gWk cZl  
B]Ya n`\UbXY`h`Yg`g]Wk`\]YfVY`]i a`Y]bY`VYUWk`h`]Wk Y  
l bhYfghØhni b[ `j cb`ØVYf`&\$\$`A ]`]cbYb`9i fcž`X]Y`ZØf`nk Y]  
VYXYi hYbXY`9`Y\_hfc`mgY!Dfc ^Y\_hY`VYfY]h[ YghY`h`k YfXYb`"8]YgY  
Dfc ^Y\_hY`VYZ]bXYb`g]Wk`gck c`\`]b`A YW`YbVi f[ !J cfdca a Yfb`U`g  
Ui Wk`]b`6fUbXYbVi f[ `i bX`g]bX`HY`]Y]bYf[ fØ» YfYb`GhfUhY[ ]Yž`X]Y  
≠Xi ghf]Y`a ]h[ fØbYa`K UggYfghc ZZ`ni `j Yfgcf[ Ybž`i a`X]Y  
9bYf[ ]Yk YbXY`j cfUbni hfY]VYb"

K ]fhgWk UZh`]Wk Y`⇒a di`gY`ZØf`X]Y`≠Xi ghf]Y

C Vk c`\`X]Y`B UWk ZfU[ Y`bUWk`[ fØbYa`K UggYfghc ZZ`VYfY]hg  
VYa Yf`Ybgk Yfh`]ghž`g]Y\`h`6]gWk cZlB ]Ya n`bcWk`Yf`YV`]Wk Yg

DchYbn]U`Z0f`k Y]hYfYg`K UW\ghi a ž]bgVYgcbXYfY`]b`XYf`#Xi ghf]Y"  
9f`cZžXUgg`l bhYfbY\`a Yb`k ]Y`GhU\`k Yf\_Y`]b`9]gYb\ØhhYbghUXh  
]\fY`5b`U[ Yb`Ub`X]Y`bYi Y`HYWbc`c[ ]Y`UbdUggYb`k YfXYb"i a  
X]YgY`HfUbgZcfa Uh]cb`ni`VYgW\`Yi b][ Ybž`g]bX`5bfY]nY  
i bYf`Àgg`]Wž`X]Y`XYb`6YhfY]VYfb`\`Y`ZYbž`]b`X]Y`bUW\`U`h][ Y  
Bi hni b[ `j cb`K UggYfghcZ`ni`]bj Ygh]YfYb"

8Yf`J c fghUbX`j cb`9bYfhfU[ `\YVh`\Yfj cfž`k ]Y`k ]W\h][ `Yg`]ghž`XYb  
l bhYfbY\`a Yb`\_`Uf`ni`a UW\Ybž`XUgg`X]Y`l a ghY``i b[ `Ui Z[ f0bYb  
K UggYfghcZ`b]W\h`bi f`0`c`c[ ]gW\ž`gcbXYfb`Ui W\`0`cbca ]gW\  
g]bbj c``]gh"i bhYfbY\`a Yb`VYb0h][ Yb`VY`UghVUfY`k ]fhgW\UZh]W\Y  
FU\`a YbVYX]b[ i b[ Yb`i bX`l bhYfgh0hni b[ ž`i a`XYb`K YW\gY`ni  
VYk`À`h][ Yb`i bX`[ `Y]W\`nY]h][ `]\fY`K YhVYk YfVgZ`À\][ `\_Y]h`ni  
k U\`fYb"

## DchYbn]U`]b`GW\k YXh`bi hnYb

9]b`VYgcbXYfg`j ]Y`j YfgdfYW\YbXYf`GhUbXcfh`Z0f`X]Y  
K UggYfghcZ`dfcXi`\_h]cb`]gh`GW\k YXhž`k c`Yg`[ fc»Y`A`0[ `]W\`\_Y]hYb  
Z0f`X]Y`l a ghY``i b[ `j cb`9fX`0`Ui Z[ f0bYb`K UggYfghcZ`[ ]Vh" < ]Yf  
\_0bbhY`Y]bY`?ca`V]bUh]cb`Ui`g`K ]bX!`i bX`Gcb`bYbYbYf[ ]Y`Y]bY  
bYi`Y`; fi bX`U[ Y`Z0f`X]Y`fUZZ]b]YfhY`K UggYfghcZ`dfcXi`\_h]cb  
gW\UZZYb"6]gW\c`Z]B]Ya`n`VYhcbhž`XUgg`GW\k YXh`0VYf`Y]bY  
Ui`»Yf[ Yk`0\`b`]W\Y`@UbXgW\UZh`j YfZ0[ hž`X]Y`g]W\`U`g`]XYU`Yf  
GhUbXcfh`Z0f`YfbYi`YfVUfY`9bYf[ ]Yb`Y][ bYhž`XU`VYfY]hg`j ]Y`Y  
5b`U[ Yb`]b`X]YgYf`F`Y[ ]cb`Yl ]gh]YfYb`i bX`k Y]hYfYf`5i`gVUi  
fYU`]g]YfVUf`]gh"

8]Y`HfUbgZcfa Uh]cb`i bX`X]Y`bUW\`U`h][ Y`l a ghY``i b[ `[ Ub`nYf  
#Xi ghf]Yb`g]bX`\_ca`d`Yl Y`<YfUi`gZcfXYfi b[ Ybž`UVYf`9bYfhfU[ `]gh  
ZYgh`XUj cb`0VYfnYi [ hž`XUgg`Xi`fW\`XUg`9b[ U[ Ya`Ybh`Z0f`Dfc`Y`\_hY  
k ]Y`]b`GW\k YXh`i bX`XYb`; 0fXYfa`]hhY`b`XYf`6i bXYgfY[ ]Yfi b[  
k ]W\h][ Y`GW\`f]hhY`]b`F]W\`hi b[ `Y]bYf`[ f0bYb`Ni`\_i bZi`[ Ya`UW\`h  
k YfXYb`\_0bbYb" #XYa`Ui`ZYfbYi`YfVUfY`9bYf[ ]Yb`[ YgYhnh`k ]fXž  
\_0bbhY`8Yi`hgW\`UbX`j cb`Y]bYf`]a`a`YbgYf`F`c`Y`VY]`XYf`[ `cVU`Yb  
K UggYfghcZ`] Yfgcf[ i b[ `dfcZ]h]YfYb"

K`À`fYbX`9bYfhfU[ `]bbc`j Uh]j Y`@0gi b[ Yb`Z0f`Y]bY`bUW\`U`h][ Y

K UggYfghc Zzdfc Xi \_h]cb`UbV]YhYhž`V`Y]Vh`X]Y : fU[ Yž`k ]Y`X]Y  
dc`]h]gW`Y`i bX`k ]fhgW`UZh]W`Y`i bhYfghØhni b[ `k Y]hYf`Ui g[ YVUi h  
k YfXYb`\_Ubb`"9g`]gh`Yb`hgW`Y]XYbXž`XUgg`gck c\`X]Y`F`Y[ ]Yfi b[ `U`g  
Ui W`X]Y`ϕXi ghf]Y`ni gUa`a`YbUfVY]hYbž`i a`X]Y`ϕZfUghfi \_hi f`ZØf  
K UggYfghc Zz`ni`Y`b`hk ]W`\_Y`b`i bX`X]Y`5`\_nY`dh`Ub`n`]b`XYf`V`fY]hYb  
2 ZYbh]W`\_Y]h`ni`ZØfXYfb`"

ϕ`Y]bYf`NY]hž`]b`XYf`XYf`?`]a`Uk`UbXY`i`bX`X]Y`9bYf[ ]Yk`YbXY`]a  
: c`\_i`g`ghY`Ybž`k ]fX`X]Y`F`c`Y`j`cb`i`bhYfbY`a`Yb`k ]Y`9bYfhfU[  
ni bY`a`YbX`VYXYi hYbX`"8]YgY`i`bhYfbY`a`Yb`UVYb`XUg  
DchYbn]U`ž`b]W`h`bi`f`b`Yi`Y`5`fVY]hgd`À`hnY`ni`g`W`UZZYbž`gc`bXYfb  
Ui W`Y`ggY`bh]Y`Y`6Y]hfÀ[ ]Y`ni`f`F`Y`Xi`\_h]cb`XYf  
HfY]V`U`i`g[ ]UgYa`]gg]cbYb`ni`Y]ghYb`i`bX`gca`]h`ni`f[ `cVU`Yb  
?`]a`Udc`]h]\_`ni`j`Yfa`]hY`b`"

8]Y`Zc`fhgW`f]h`h]W`Y`b`Dfc`Y`\_hY`j`cb`9bYfhfU[ `k`Y]gYb`XYb`K`Y[ `ZØf  
UbXYfY`i`bhYfbY`a`Ybž`X]Y`YVYbZU`g`]b`XYf`K`UggYfghc`Zk`]fhgW`UZh  
: i`»`ZUggYb`k`c`Y`b`"9g`V`Y]Vh`gd`UbbYbX`ni`g`Y`Ybž`k ]Y`g`W`bY`X]Y  
A`c`XY`Y`j`cb`9bYfhfU[ `Ui`Z`UbXYfY`F`Y[ ]cbYb`i`bX`ϕXi`ghf]Yb  
ØVYfhfU[ ]b`k`YfXYb`\_Ø`bYbž`i`a`X]Y`b`UW`U`h][ ]Y  
9bYf[ ]YYfnYi [ ]i`b[ `k`Y]hYf`j`cfUbni`hfY]VYb`"

Dc`]h]gW`Y`F`U`a`YbVYX]b[ ]i`b[ ]Yb`ZØf  
K UggYfghc Zzdfc`Y`\_hY

8]Y`dc`]h]gW`Y`i`bhYfghØhni`b[ `]gh`Yb`hgW`Y]XYbX`ZØf`XUg`K`UW`ghi`a  
XYf`K`UggYfghc`Zk`]fhgW`UZh`]b`8Yi`hgW`U`bX`"a`B`Uh]cb`U`Yb  
K UggYfghc`ZzghfUhY[ ]Y`XYf`6i`bXYgfY[ ]Yfi`b[ `U`h`g]W`8Yi`hgW`U`bX  
ni`a`N]Y`[ ]YgYhnhž`V]g`&\$`\$`Y]bY`?`UdUn]h`h`j`cb`)`;`][`Uk`Uh`Ub  
9`Y`\_hfc`mgYi`fYb`ni`f`<`YfghY`i`b[ ]j`cb[ ]fØbYa`K`UggYfghc`Zz  
Ui`gni`V`Ui`Yb`"8]YgY`ϕ]h]Uh]j`Y`k`]fX`Xi`fW`j`YfgW`]YXYbY  
: ØfXYfdfc[ ]fUa`a`Y`i`bX`?`ccdYfUh]cbYb`a`]h`XYf`ϕXi`ghf]Y  
i`bhYfghØhnhž`i`a`X]Y`b`chk`YbX][ ]Yb`ϕj`Ygh]h]cbYb`i`bX`ϕbcj`Uh]cbYb  
j`cfUbni`hfY]VYb`"9]b`nYb`hfU`Yg`9`Ya`Yb`h]gh`X]Y`: ØfXYfi`b[ ]j`cb  
: cfgW`i`b[ ]g[ ]i`bX`9b`hk ]W`\_i`b[ ]gd`fc`Y`\_hY`bž`X]Y`ni`f  
9ZZ]n]Y`b`nghY][ ]Yfi`b[ `VY]`XYf`9`Y`\_hfc`mgY`VY]hfU[ ]Yb`gc`Y`b`"8]Yg  
gd]Y`h`b]W`h`bi`f`Y]bY`F`c`Y`ZØf`X]Y`K`Y`h`VY`k`Y`fV`gZ`A`][ ]\_Y]h`XYg  
GY`\_hc`fgž`gc`bXYfb`Ui`W`ZØf`X]Y`ØVYf[ ]fY]ZYbXYb`?`]a`Un]Y`Y`XYf`"

6i bXYgfY[ ]Yfi b[ "

8]Y<YfUi gZcfXYfi b[ YbžX]Y`X]YgY`A U» bU\ a Yb`a ]h'g]W\`Vf]b[ Ybž  
g]bX`j ]Y`ZÀ`h][ "9g`VYXUfZ`b]W\`h`bi`f`Y]bYf`Yb`hgd`fY`W\`Yb`XYb  
`bZ`fUghfi`\_hi`fž`gcb`XYfb`Ui`W\`Y]bYg`\_`UfYb`fY`W\`h]W\`Yb`F`U\`a`Ybgž  
XYf`X]Y`Bi`hni`b[ `j`cb`K`UggYfghc`ZZ`gck`c\``]b`XYf``bXi`ghf]Y`U`g`Ui`W\`  
]a`J`Yf`\_`Y\`fggY`\_hc`f`Z`f`XY`fh```b`X]Y`gYa``?`cb`hY`I`h]gh`Y`g`k` ]W\`h][`ž`X`Ugg  
X]Y` ;`Yg`Y`hn[`Y`Vi`b[ `Z`YI` ]VY``V`Y]Vhž`i`a` `Ui`Z`hY`W\`bc`c`[ ]g`W\`Y  
:`c`fhg`W\`f]hh`Y`fY`U[ ]Y`fY`b`ni` `Ö`bb`Yb``9]bY`Yb[ Y`Ni`gUa`a`Yb`Uf`VY]h  
nk` ]g`W\`Yb`6i`bXž`@`Ab`XYfb`i`bX`XYf``bXi`ghf]Y`\_`Ubb`X`Uni` `VY]hf`U[ Ybž  
X]Y`F`Yggci`f`W\`b`c`dh]a`U`ni` `bi`hn`Yb`i`bX`G`mb`Yf[ ]Yb`ni` `g`W\`UZZ`Yb"

K UW\ ghi a gdfc [ bcgYb`Z`f`X]Y

K UggYfghc`ZZk` ]fhgW\`UZh`

8]Y`K` UggYfghc`ZZk` ]fhgW\`UZh`YfZÀ`fh`U`\_hi`Y``Y]bYb`Yf`YV`]W\`Yb  
5i`Zg`W\`k`i`b[`ž`i`bX`D`fc[`bcgYb`[`Y\`Yb`X`Uj`cb`Ui`gž`X`Ugg`XYf`A`Uf`\_h  
Z`f`K` UggYfghc`Z`hY`W\`bc`c`[ ]Yb`]b`XYb`\_`ca`a`Yb`XYb``X\`fYb  
YI`dcb`Yb`h]Y``k`UW\`gYb`k` ]fX``@`Ui`h`Y]bYf`G`hi`X]Y`j`cb`6`c`ca`VYf[`B`9:  
k` ]fX`XYf`[ `c`V`U`Y`A`Uf`\_h`Z`f`K` UggYfghc`Z`V]g`&`\$` \$`Ui`Z`Y`hk`U`+`\$\$  
A`j``]Uf`XYb`i`G!`8`c``Uf`U`bk`UW\`gYb`\_`Ö`bb`Yb``9]b`k` ]W\`h][`Yf`H`fY]VYf  
X]Y`g`Y`g`K`UW\`ghi`a`g`]gh`X]Y`B`c`hk`Yb`X][`\_`Y]hž`7`C`&!`9a` ]gg]cb`Yb`]b  
j`Y`fg`W\`]Y`XYb`Yb`G`Y`\_`hc`fYb`ni` `fY`Xi`n]Y`fYb`ž`]bg`VY`gcb`XY`fY`]a  
J`Yf`\_`Y\`fg!`i`bX``bXi`ghf]Y`gY`\_`hc`f"

`b`8`Yi`hgW\`UbX`]gh`X`Ug`D`ch`Y`bn]U``Z`f`[`f`Ø`b`Yb`K` UggYfghc`ZZ  
VY`gcb`XY`fg`\`c`W\`ž`X`U`X`Ug`@`Ub`X`Ø`VY`f`i`a`Z`UggYb`XY`Y`fb`Yi`Y`fV`U`fY  
9b`Yf[ ]Yb`j`Yf`Z`f`h`B`UW\`U`\_hi`Y``Yb`G`W\`À`hni`b[ Yb`\_`Ö`bb`hY`XYf  
6Y`X`Uf`Z`Ub`[`f`Ø`b`Ya` `K` UggYfghc`Z`V]g`&`\$`(`)`]b`8`Yi`hgW\`UbX`Ui`Z`&`\$\$  
H`Y`f`U`k`U`h`gh`i`b`XYb`d`f`c``X\`f`ghY][`Yb``8]Y`g`]gh`]bg`VY`gcb`XY`fY`fY`Y`j`Ub`h  
Z`f`Y`b`Y`f[ ]Y]b`h`Y`bg]j`Y``bXi`ghf]Yb`k` ]Y`X]Y`G`hU`\`d`f`c`Xi`\_`h]cb`ž`k`c  
K` UggYfghc`Z`Y]bY`G`W\`Ø`ggY`f`c``Y`VY]a` ,`VYf[`Ub[ `ni`Y]bYf  
\_`]a`Ub`Yi`hf`U`Y`b`D`f`c`Xi`\_`h]cb`gd]Y`Yb`\_`Ubb``8]Y``b`hY[`f`U`h]cb`j`cb  
K` UggYfghc`Z`]b`VY`ghY`Y`b`XY`D`f`c`Xi`\_`h]cb`gd`f`c`nY`ggY`Y`f`Ö`Z`b`Y`h`b`Yi`Y  
A`Ö[ `]W\`\_`Y]hYb`ni`f`F`Y`Xi`n]Y`fi`b[ `X`Y`f`5`V`\`Ab`[ ][\_`Y]h`j`cb`Z`c`gg]Yb  
6`fY`b`bg`hc`Z`Y`b`ž`k`Ug`Y`b`hg`W\`Y]X`Y`b`X`Z`f`Y]bY`b`UW\`\`U`h][`Y`Ni`\_`i`b`Z`i`]gh"

HYW\ bc`c [ ]gW\ Y : c fhgW\ f]hhY`]b`XYf

9`Y\_hfc`mgY

8]Y`HYW\ bc`c [ ]Y`XYf`9`Y\_hfc`mgY` \Uh`g]W\` ]b`XYb`Y`hnhYb` \U\ fYb  
XYi h]W\` j YfVYggYfhi bX` ]gh`\_cghYbYZZ]n]YbhYf` [ Yk cfXYb`"8 ]Y  
9bhk ]W\_`i b [ `bYi Yf`A UHYf]U` ]Yb`i bX` J YfZU\ fYb`ni f`J YfVYggYfi b [   
XYf`9ZZ]n]Ybn`j cb`9`Y\_hfc`mgYi fYb` ]gh`YbhgW\Y]XYbXž`i a` `X]Y  
DfcXi \_h]cbg\_cghYb` j cb` [ fØbYa` `K UggYfghcZZ`k Y]hYf`ni` `gYb\_Yb`"  
`bcbj Uh]cbYb`k ]Y`DYa` !`fDfchcb`9i W\Ub [ Y`A Ya VfUbYŁ`i bX  
5`\_U` ]bY`9`Y\_hfc`mgYi fY`k Y]gYb`j ]Y`j YfgdFYW\YbXY : c fhgW\ f]hhY  
Ui Zi bX`Yfa` Ò [ `]W\Yb`Y]bY`ZYI ]V`YfY`5bk YbXi b [ `i bX``b`hY [ fUh]cb  
]b`VYghY\YbXY`YfbYi YfVUfY`9bYf [ ]YgmghYa` Y`"

Ni XYa` `k ]fX`Ub`XYf`J YfVYggYfi b [ `XYg`9bYf [ ]Ya` UbU [ Ya` Ybhg  
 [ YUfVY]hYhž`XUg`YggYbh]Y`Y`F`c`Y`XUVY]`gd]Y`hž`GW\k Ub\_`i b [ Yb` ]b  
XYf`9bYf [ ]YYfnYi [ i b [ `Ui`g`K ]bX`i bX`GcbbY`Ui`gni [ `Y]W\Yb`"8 ]YgY  
C dh]a` ]Yfi b [ Yb`g]bX`YbhgW\Y]XYbXž`i a` `X]Y`DfcXi \_h]cb`j`cb  
 [ fØbYa` `K UggYfghcZZ`ni`j Yf`Àgg] [ `i bX`k ]fhgW\UZh]W\`ni` [ YghU`hYb`"  
9g` ]gh`ni` Yfk UfhYbž`XUgg`ni` \_ØbZh] [ Y : c fgW\i b [ `i bX`9bhk ]W\_`i b [   
bcW`YZZ]n]YbhYfY`i bX`\_cghYb [ Øbgh] [ YfY`@Øgi b [ Yb` \Yfj`cfVf]b [ Yb  
k ]fXž`X]Y`XUg`K UW\ghi a` `XYg`GY`hc fg`k Y]hYf`j`cfUbhfY]VYb`"

8YhU]`g

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