

K ]gg`Yf`i bX`GWX ]fXYk Ub. `F ØW\_hf]hh`i bX  
GY`Vgh\_f]h]\_`j cf`Yb hgWX Y]XYbXYb`K U\`Yb

8]Y`@]b\_Yb!7\YZg`K ]gg`Yf`i bX`GWX ]fXYk Ub`ØVYb`bUWX`]\fYf  
F ØW\_hf]hggUb\_ØbX][ i b [ `GY`Vgh\_f]h]\_`i bX`h\Ya Uh]g]YfYb  
]bbYfY`?cbZ]\_hY"

⇒Y]bYf`Ui ZgWX`i ggfY]WX`Yb`DfYggY`\_cbZYfYbn`]b`6Yf`]b` \UVYb`X]Y  
VY]XYb` : Ø\fi b [ gdYfgØb`]WX`\_Y]hYb`XYf`@]b\_gdUfhY]ž`U]b]bY`K ]gg`Yf`  
i bX`A Ufh]b`GWX ]fXYk Ubž`\_Øfn`]WX`]\fY`F ØW\_hf]hggUb\_ØbX][ i b [   
Yf`Äi hYfh`"6Y]XY`7\YZg` [ UVYb`VY`\_Ubbhž`XUgg`g]Y`VY]a  
VYj cfghY`YbXYb`DUfhY]hU[ `]a`C`\_hcVYf`b]WX`hZØf`Y]bY`K ]YXYfk U\`  
\_UbX]X]YfYb`k YfXYb`"K ]gg`Yf`i bX`GWX ]fXYk Ub`Y]b [ YfÄi a hž`XUgg  
X]Y`DUfhY]nYbhfU`Y`]b`XYb`YmhYb`U\`fYb`XYb` : c\_i`g`j YfZY`h` \UVYž  
]bgVYgcbXYfY`]b`XYf`5i`gY]bUbXYfgYhni b [ `a`]h`dc`]h]gWX`Yb  
; Y [ bYfb`i bX`XYb`j cf`YffgWX`YbXYb`Ni`ghÄbXYb"

K ]gg`Yf`VYnY]WX`bYhY`X]Y`5VgdU`hi b [ `XYg`6ØbXb]ggYg`GU`fU  
K U [ Yb\_bYWX`h`fßGK`Ł`U`g`Y]bY`Yb hgWX`Y]XYbXY`9bhk ]W`i b [ ž`X]Y`X]Y  
DUfhY]`ghUf`\_]b`5bgdfi`WX` [ Ybca`a`Yb` \Uh`"~K ]f` \UVYb`gY`f`j` ]Y`  
NY]hi bX`F Yggci`fWX`b`]b`X]YgYb`?cbZ]\_h`]bj`Ygh]Yfh` ž`a`Y]bhY`g]Y  
i bX`ZØ [ hY` \]bni`ž`XUgg`]a`F ØW`V`]W`\_X]YgY`HfYb`bi b [ ` " ØVYfZÄ`][ ~  
 [ Yk`YgYb`k`ÄfY`"8]Y` ('`!`Ä`f][ Y`Dc`]h]\_Yf]b`VY`Yi`WX`hYhY`Ui`WX`X]Y  
]bhYfbY`NYfghf]hhYb` \Y]h`]bbYf`U`V`XYf`DUfhY]ž`X]Y`Y]b`ghÄbX][ Yg  
DfcV`Ya`XUf [ YghY`h` \Uh`"G]Y`VYhcbhYž`XUgg`X]Y`ÖZYb`h`]WX`Y`?f]h]\_  
j`cb`DUfhY]a`]h [ `]YXYfb`Ua`5bgY`Yb`XYf`@]b\_Ybž`X]Y`gcn]U`Y` : fU [ Yb  
b]WX`h`a`Y`f`UXÄei`Uhj`YfhfYhYž`Y]b`~XYgUghf`ÖgYg`6]`X`" ` \]bhYf`UggYb  
 \UVY"

⇒bbYfY`?cbZ]\_hY`i bX`²`ZZYb`h`]WX`\_Y]hgUfVY]h

9]b`nYbhfU`Yf`Di`b`h`XYg` ; Ygd`ÄWX`g`k`Uf`XYf`i`a` [ Ub [ `a`]h

]bbYfdUfhY]WYb'?'cbZ]\_hYb"GW]fXYk Ub'UddY`YfhY`Y]bXf]b[ `]Wž  
XUgg`X]YgY`Ui W`bUW`XYf`5VgdU`hi b[ `j ca `6GK `b]W`h`a`Y`f  
ÖZYbh]W`Ui g[ YhfU[ Yb`k YfXYb`gc`hYb"9f`Yf\_UbbhY`Ubž`XUgg  
k ]YXYf`c`h`~ghÖfYbXY`BYVYb[ YfÄi gW`Y" `Ui Z[ YhfYhYb`g]bXž`X]Y  
XYf'; `Ui Vk ØfX][ \_Y]h`XYf`DUfhY]'gW`UXYb" `8]YgYf`9]bXfi W\_`j`cb  
l bY]b][ \_Y]h`gY]'a `dc`h]gW`Yb`F`Ui a `b]W`h`ni`ØVYfgY`Yb`i`bX`U`h  
dchYbn]Y`bY[ Uh]j`Y`5i`gk`]f`\_i`b[ Yb`Ui`Z`X]Y`K`U`fbY`a`i`b[ `XYf  
@]b\_gdUfhY]"

8 Ug`fYW`bh`m`Y`f`V`V`h`Y`K`U`X`Y`V`U`\_`Y`X`Y`f`@]b\_gdUfhY]ž`X]Y`V`Y]`X`Y`f`  
9i`fcdUk`U`b`i`f`&ž+`D`f`c`n`Y`b`h`X`Y`f`G`h]a`a`Y`b`Y`f`U`h`Y`b`U`h`ž`g`h`Y`h`  
Y`V`Y`b`Z`U`g`]a`A`]h`h`Y`d`i`b`\_`h`X`Y`f`F`Ø`W`\_`h`f]h`h`g`Ø`V`Y`f`Y`[`i`b`[`Y`b`"8`Y`f`8`fi`W`  
Ui`Z`X]Y`:`Ø`f`i`b`[`k`i`f`X`Y`a`Y`f`\_]W`g`h`Ä`f`\_`Y`f`ž`i`b`X`K`]g`g`Y`f`i`b`X  
G`W`]f`X`Y`k`U`b`Y`f`\_`Ä`f`h`Y`b`ž`X`U`g`g`]\`f`F`Ø`W`\_`ni`[`Y`]b`Y`i`b`U`V`Ä`b`[`][`Y`  
9`b`h`g`W`Y`]X`i`b`[`k`U`f`"G`W`]f`X`Y`k`U`b`V`Y`\_`f`Ä`Z`h][`h`Y`."~`Ä`W`U`V`Y`a`]W`b`]W`h`  
[`Y`X`f`Ä`b`[`h`[`Y`Z`Ø`h`"8]Y`V`Y]X`Y`b`A`U`W`h`j`b`U`V`Y`f`Y`[`h`Y`b`Y`X`c`W`X`U`f`ž`  
X`U`g`g`]\`f`F`Ø`W`\_`ni`[`X`i`f`W`X`Y`b`V`Y`j`c`f`g`h`Y`Y`b`X`Y`b`  
@]b`X`h`U`[`g`k`U`n`m`\_i`g`]a`C`g`h`Y`b`8`Y`i`h`g`W`U`b`X`g`ž`]b`g`V`Y`g`c`b`X`Y`f`Y`]b`  
G`U`W`g`Y`b`ž`H`Ø`f]b`[`Y`b`i`b`X`6`f`U`b`X`Y`b`V`i`f`[`ž`V`Y`X]b`[`h`k`U`f`"

K`]g`g`Y`f`V`Y`h`c`b`h`Y`ž`X`U`g`g`X]Y`DUfhY]ZØ\fi`b`[`X`Y`b`\_`Ø`b`Z`h][`Y`b`  
B`U`W`Z`c`[`Y`f`b`[`Y`b`Ø[`Y`b`X`N`Y]h`ZØf`]\`f`Y`J`c`f`V`Y`f`Y]h`i`b`[`Y`b`Y]b`f`Ä`i`a`Y`b`  
a`Ø`g`g`Y`"K`Ä`f`Y`b`X`X]Y`DUfhY]'g]W`b`c`W`j`c`b`X`Y`b`Y`h`h`Y`b`  
5`V`g`h]a`a`i`b`[`Y`b`Y`f`c`h`ž`\_`Ø`b`b`h`Y`b`X]Y`\_`ca`a`Y`b`X`Y`b`K`U`Y`b`Y]b`Y`  
k`]W`h][`Y`F`c`Y`X`U`V`Y]`g`d]Y`Y`b`ž`k`]Y`g]W`X]Y`@]b\_gdUfhY]'b`X`Y`f`  
dc`h]g`W`Y`b`@]b`X`g`W`U`Z`h`d`c`g]h]c`b]Y`f`h`"

K`Ä`f`Y`b`X`G`W`]f`X`Y`k`U`b`d`U`b`h`ž`b`U`W`g`Y]b`Y`a`F`Ø`W`\_`ni`[`U`g`  
DUfhY]j`c`f`g]h`n`Y`b`X`Y`f`]b`g`Y]b`Y`F`c`Y`U`g`:`f`U`\_`h]c`b`g`j`c`f`g]h`n`Y`b`X`Y`f`]a`  
9i`fcdÄ]g`W`Y`b`DUf`U`a`Y`b`h`ni`f`Ø`W`\_`ni`\_`Y`f`Y`b`ž`a`Ö`W`h`Y`K`]g`g`Y`f`  
k`Y]h`Y`f`]\`b`]\`f`Y`f`:`i`b`\_`h]c`b`U`g`6i`b`X`Y`g`h`U`[`g`U`V`[`Y`c`f`X`b`Y`h`Y`ZØf`  
<`Y`g`g`Y`b`h`Ä`h][`g`Y]b`"8]Y`g`Y`\_`U`f`Y`b`D`Y`f`g`d`Y`\_`h]j`Y`b`n`Y][`Y`b`ž`X`U`g`g`h`f`c`h`n`  
X`Y`f`<`Y`f`U`i`g`Z`c`f`X`Y`f`i`b`[`Y`b`ž`a`]h`X`Y`b`Y`b`X]Y`DUfhY]'\_`c`b`Z`f`c`b`h]Y`f`h]g`h`ž`X]Y`  
V`Y]X`Y`b`D`c`h]\_`Y`f`V`Y`U`V`g]W`h][`Y`b`ž`U`\_`h]j`[`Y`V`]Y`V`Y`b`ni`g`Y]b`"

9]b`Y`b`Y`i`Y`Y`f`U`ZØf`X]Y`@]b\_gdUfhY]3

8`Y`f`F`Ø`W`\_`h`f]h`j`c`b`K`]g`g`Y`f`i`b`X`G`W`]f`X`Y`k`U`b`\_`Ø`b`b`h`Y`Y]b`Y`K`Y`b`X`Y`ZØf`

X]Y`@]b\_gdUfhY]XUfghY`Ybž`X]Y`j cf`XYf`5i Z[ UVY`ghY\hž`]\f`DfcZ`]`]b  
Y]bYf`]a a Yf`bcW\`dc`Uf]g]YfhYb`dc`]h]gWYb`@UbXgWUZh`ni  
gW\ÄfZYb``8]Y`<YfUi gZcfXYfi b[ Yb`g]bX`nk Uf`VYhf\W\h`]Wž`UVYf  
X]Y`DUfhY`]\Uh`X]Y`A Ö[ `]W\`\_Y]hž`Xi fW\`]bhYfbY`?c`\Äg]cb`i bX  
ghfUHy[ ]gWY`B`Yi Ui gf]W\hi b[ `Y]bY`ghÄf`\_YfY`GhY``i b[ `ni `Yf`Ub[ Yb`  
CV`X]YgY`J YfÄbXYfi b[ Yb`[ `Y]b[ Yb`k YfXYbž`V`Y]Vh`UVni k UfhYbž`  
XcW\`X]Y`≠]h]Uh]j Yb`ni f`GhÄf`\_i b[ `XYg`]bbYfdUfhY`]`]WYb  
Ni gUa a Yb`U`hg`g]bX`j cb`[ fc»Yf`6YXYi hi b[ `Z0f`X]Y`ni \_0bZh[ Y  
9bhk ]W`\_i b[ `XYf`@]b\_gdUfhY`"]

8]Y`9bhgWY]Xi b[ `j cb`≠]b]bY`K ]gg`Yf`i bX`A Ufh]b`GW\]fXYk Ubž`]\f  
5a h`U`g`DUfhY]j cfg]mYbXY`XYf`@]b`\_Yb`b]YXYfni `Y[ Ybž`ZÄ`h`]b  
Y]bYb`?cbhYi hž`XYf`Xi fW\`Y]bY`J ]Y`nU\`j cb`<YfUi gZcfXYfi b[ Yb  
[ YdfÄ[ h`]gh``8]Y`9f[ YVb]ggY`XYf`9i fcdUk U\`ž`VY]`XYf`X]Y`@]b`\_Y  
`YX][ `]W\`&ž+`DfcnYbh`XYf`Gh]a a Yb`Yf\ ]Y`hž`gd]Y[ Y`b`X]Y  
GW\k ]Yf][ \_Y]hYb`k ]XYfž`a ]h`XYbYb`X]Y`DUfhY`]`]b`XYb`Y`hnhYb`≠\fYb  
\_cbZfcbh]Yfh`k Uf``@Ui h`Y]bYf`5bU`mgY`XYg`XdU`\UhYb  
dUfhY]]bhYfbY`GhfY]h[ \_Y]hYb`i bX`X]Y`5VgdU`hi b[ `j cb`GU\FU  
K U[ Yb`\_bYW\h`Y]bYb`g][ b]Z]\_UbhYb`9]bZi gg`Ui ZXUg`ÖZZYbh]WY  
6]`X`i bX`X]Y`K Ä\`YfgWUZh`XYf`@]b`\_Yb`"]

8]Y`]bhYfbY`5i gY]bUbXYfgYhni b[ `i bX`X]Y`ZY`\YbXY`9]b`Y]h  
]bbYf\U`V`XYf`DUfhY`]`\_0bbhYb`dchYbn]Y``Y`K Ä\`Yf`UV[ YgW\fyW\_h  
\UVYb``≠`XYf`Dc`]h]\_`]gh`Yg`cZh`YbhgWY]XYbXž`Y]bYb`\_`UfYb`i bX  
Y]b`Y]h]W\Yb`GhUbXdi b`h`ni `dfÄgYbh]YfYbž`i a `K Ä\`Yf`ni  
a cV]`]g]YfYb``8]Y`@]b`\_Y`\Uh`Xi fW\`]fY`]bhYfbYb`?cbZ]\_hY`i bX  
I bY]b][ \_Y]hY]bY`7\UbW`j YfdUgghž`g]W\`U`g`hfU[ YbXY`?FUZh]b`XYf  
dc`]h]gWYb`@UbXgWUZh`ni `dfÄgYbh]YfYb`"]

8]Y`[ YgY``gWUZh`]W\Y`K U\fbY`a i b[ `XYf`  
@]b`\_Yb`

≠`XYb`Y`hnhYb`≠\fYb`\Uh`g]W\`X]Y`K U\fbY`a i b[ `XYf`@]b`\_Yb`]b  
XYf`; YgY``gWUZh`k YgYbh]W\`j YfÄbXYfh`K ]W\h][ Y`H\Ya Yb`k ]Y  
gcn]U`Y`; YfYW\h][ \_Y]h`i bX`XYf`I a [ Ub[ `a ]h`XYf`:`0W\h`]b[ g\_f]gY  
g]bX`\cWU`\_hi Y``5bU`mgYb`nY][ Ybž`XUgg`X]Y`F`Y`Yj Ubn`X]YgYf  
H\Ya Yb`Z0f`X]Y`K Ä\`YfgWUZh`\_cbghUbh`[ YV`]YVYb`]ghž`YXcW\  
b]W\h`a Y`f`]b`XYa `A U»Y`Xi fW\`X]Y`@]b`\_Y`fYdfÄgYbh]Yfh`k ]fXž`k ]Y

Yg'ZfØ\Yf'XYf': U''k Uf''9]bY'I a ZfU[ Y'XYg'⇒bZfUhYgh'8]a Ud'Ui g  
XYa' :ſ\f'&\$&&'Yf[ UVž'XUgg'j ]Y'Y'6Øf[ Yf'X]Y'@]b\_Y'b]W'h'a Y\ f'U`g  
X]Y'DUfhY]'k U\fbY\ a Ybž'X]Y'g]W'Ui ggW' ]Y»` ]W'ZØf'gcn]U`Y  
6Y`Ub[ Y'Y]bgYhnh"

8Yg'K Y]hYfYb'\Uh'X]Y'5VgdU`hi b[ 'XYg'6ØbXb]ggYg'j cb  
K U[ Yb\_bYW'h'b]W'h'bi f'ni 'Y]bYa' k Y]hYfYb'Gh]a a Ybj Yf'i ghž  
gcbXYfb'Ui W'ni 'Y]bYf': fU[ a Ybh]Yfi b[ 'XYf'dc`]h]gW'Yb'⇒XYbh]hÅh  
XYf'@]b\_Yb'[ YZØ\fh"J ]Y'Y'K Å\`Yf'\_ØbbhYb'Yhnh'i bg]W'Yf'gY]bž  
k Y`W'Yg'6]'X'X]Y'DUfhY]'j cb'g]W'gY`Vghj Yfa ]hY`h'i bX'ZØf'k Y`W'Y  
K YfhY'g]Y'hUhgÅW' ]W'ghY\h"

5VgW' ]Y» YbX'`Åggh'g]W'ZYghghY`Ybž'XUgg'X]Y'U\_hi Y`Yb  
<YfUi gZcfXYfi b[ Yb'i bX'X]Y'FØW\_hf]hHgUb\_ØbX][ i b[ 'j cb'K ]gg`Yf  
i bX'GW' ]fXYk Ub'HY]'Y]bYg'[ fØ» YfYb'HfYbXg']bbYf\U`V'XYf'@]b\_Yb  
XUfghY`Yb"i a 'X]Y'K Å\`Yf'ni fØW\_ni [ Yk ]bbYb'i bX'g]W'U`g  
Yfbghni bY\ a YbXY'dc`]h]gW'Y? fUZh'ni 'YhUV`]YfYbž'V`Y]Vh'XYf'DUfhY]  
b]W'h'bi f'X]Y' ]bhYfbY'?cbgc`]X]Yfi b[ ž'gcbXYfb'Ui W'Y]bY'\_UfY  
ghfUHy[ ]gW'Y'5i gf]W'hi b[ 'Ui Z[ YgY`gW'UZh']W'fY`Yj UbhY'H\Ya Yb  
bch'k YbX][ "8]Y'\_ca a YbXYb'@UbXhU[ gk U\`Yb' ]b'GUW'gYbž  
H\Øf]b[ Yb'i bX'6fUbXYbVi f[ 'k YfXYb'YbhgW'Y]XYbX'XUZØf'gY]bž  
k ]Y'g]W'X]Y'@]b\_Y' ]b'XYb'bÅW'ghYb'ſ\ fYb'dcg]h]cb]YfYb'\_Ubb"

8YhU]`g

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