

Nk Y]`bYi Y`DUbXU!Nk ]``b[ Y`]a`6Yf`]bYf  
Ncc.`9]b`gY`hYbYf`B UWX k i WX g

⇒ a`6Yf`]bYf`Ncc`VfUWX hY`DUbXU!A Ua U`A Yb[ `A Yb[ `Nk ]``b[ Y  
ni f`K Y`h`@YgYb`G]Y`a Y`f`ØVYf`X]Y`YfghY`DUbXU[ YVi fh]b  
8Yi hgWX`UbX`gY]h`&\$%-`i bX`X]Y`gØ» Yb`ž b[ h]YfY"

⇒ a`<YfnYb`6Yf`]bgž]a`VYfØ\`a hYb`Ncc`XYf`<Ui dhghUXhž`\Uh]g]WX  
Y]b`YfZfYi`]WX Yg`9fY][ b]g`YfY][ bYh`9]bY`DUbXUVÄf]b`bUa Ybg  
A Yb[ `A Yb[ `U`h`Nk ]``b[ Y`ni f`K Y`h[ YVfUWX`h`8]Y`B UWX f]WX h  
k i fXY`j cb`XYa`Ncc`Ua`8 cbbYfghU[ `j YfØZZYbh]WX hi bX`gcf[ h`ZØf  
[ fc» Y`i: fYi XY`i bhYf`H]Yf`]YV\UVYfb``8]Y`VY]XYb`\_`Y]bYb`DUbXU!  
ž b[ Yb`\UVYb`Y]b`; Yk ]WX hj cb`%`\*`; fUa a`i bX`%\*-`-`; fUa a`i bX  
YfV`]W`hYb`Ua`A ]h`k cWX ž`i`&`"5i [ i ghž`XUg`@]WX h`XYf`K Y`h"

8]Y`; YVi fh`ZUbX`]a`gdYn]Y`Yb`DUbXU[ UfhYb`XYg`Ncc`6Yf`]b`ghUhhž  
k c`X]Y`5i Zni WX h`XYf`DUbXUg`i bhYf`cdh]a`U`Yb`6YX]b[ i b[ Yb  
[ Yk Ä`f`Y]ghYh]gh``6Y]XY`?`Y]bYb`g]bX`k c`\Ui Zi bX`k YfXYb  
Ui Za Yf\_gUa`j cb`]fYf`A i hYf`i bX`XYa`Yb[ U[ ]YfhYb`DUbXU!HYUa  
XYg`Nccg`j Yfgcf[ h`8 Ug`Ncc!HYUa`ØVYfk UWX h`X]Y`ž b[ Yb`b]WX h  
bi f`ghÄ`bX][ ž`gcbXYfb`g]Y`ZØ`fYb`Ui WX`fY[ Y`a`Ä»][ Y`?`cbhfc``Yb  
Xi fWX ž`i a`X]Y`9b`hk ]W`\_i b[ `XYf`\_`Y]bYb`H]YfY`ni`VYcVUWX hYbž  
Ä`b`]WX`k ]Y`]b`Y]bYf`6UVmghUh]cb`]a`?`fUb`\_`Yb`\Ui`g"

9]b` \ ]ghcf]gWX Yf`A ca Ybh`ZØf`XYb`Ncc`i bX  
X]Y`5fh

8]YgY`; YVi fh]gh`ZØf`XYb`Ncc`Y]bY`VYa Yf`\_`Ybgk YfhY`@Y]ghi b[ ž`XU  
Yg`g]WX`Yfghi a`X]Y`nk Y]hY`; YVi fh]j cb`DUbXUg`]b`8Yi hgWX`UbX  
\UbXY`h`A Yb[ `A Yb[ `U`h`Y`VYfY]hg`&\$%-`Nk ]``b[ Y`]b`6Yf`]b`ni f  
K Y`h[ YVfUWX`hž`k Ug`X]Y`6YXYi hi b[ `X]YgYf`9fY][ b]ggY`ni`gÄ`h`]WX  
i bhYfghfY]WX h`` 8]Y`?`Y]bYb`a UWX Yb`Y]bYb`a i bhYfYb`9]bXfi W\_ ž

gU[ h'8 f''5bXfYUg'?'b]Yf]Ya ž'XYf'8]fY\_hcf'XYg'Nccg''9f'ZØ[h'\]bni ž  
XUgg'A Yb[ 'A Yb[ 'Y]bY''YVYj c''Y'i bX'ZØfgcf[ 'WXY'A i hYf'ghž'i bX  
\YVh'X]Y'6YXYi hi b[ 'j cb' 6ĀfYb'YVY '\Yfj cfž'X]Y'g]W' ]b'XYf  
: Øfgcf[ Y'XYf'A i hYf'ZØf'\fY'BUW\_ca a Yb'nY][ h'

5a '%%'5i [ i gh'\UhhY'Y]bY'I 'hfUgWU''i bhYfgi W'i b[ 'VYfY]hg  
[ YnY][ hž'XUgg'Yg'nk Y]'< YfngW'Ā[ Y'[ UVž'k Ug'Ui Z'X]Y  
VYj cfghY\YbXY'; YVi fh'\]bk ]Yg''8]Y'HfU[ nY]h'VYhfi [ ' ]bg[ YgUa h  
%(- 'HU[ Y''8]Yg'j YfXYi h]W'hž'k ]Y'k ]W'h][ 'YXY'D\UgY'XYf  
GWk Ub[ YfgWUZh'ZØf'X]Y'9bhk ]W' i b[ 'XYf'H]YfY' ]gh''K ]Y'VY]  
UbXYfYb' [ fc» Yb'6ĀfYbUfhYb'\_ca a Yb'X]Y'\_Y]bYb'DUbXUg' ]b  
Y]bYa 'gY\ f'ZfØ\Yb'9bhk ]W' i b[ gghUX]i a 'ni f'K Y'h'ZUgh'bUW\_hž  
V' ]bXž'hi V' i bX'fcgU''8]Y'W'UfU\_hYf]gh]gW'Y'gW'k Ufn!k Y]» Y  
NY]W'bi b[ 'Ybhk ]W\_Y'hig]W'YfghgdĀhYf''

## 8 Yf'9f\ U'h'XYf' [ YZĀ\ fXYhYb'5fh

8]Y'; YVi fh] cb'Nk ]''b[ gh]YfYb'\Uh'k Y]hfY]W'YbXY'5i gk ]f\_i b[ Yb  
Ui ZXYb'9f\U'h'XYf'; fc» Yb'DUbXUgž'X]Y' ]b'XYf'BUh' f'ni 'XYb  
VYXfc\hYb'5fhYb' [ Y\ŌfYb''A ]h'k Yb][ Yf'U'g'&''\$\$\$  
Ui g[ Yk UW'gYbYb' bX]j ]Xi Yb' ]b'ZfY]Yf'K ]'XVU\ b' ]gh'YXYg  
bYi [ YVcfYbY'H]Yf'j cb'Ybcfa Yf'6YXYi hi b[ 'ZØf'XYb': cfhVYghUbX  
XYf'5fh''8f''?'b]Yf]Ya 'VYhcbhž'XUgg'YXYg'Y]bnY'bY'ž b[ h]Yf' Y]b  
k ]W'h][ Yf'6Y]hfU[ 'ni a '9f\U'h'X]YgYf' [ YZĀ\ fXYhYb'H]YfUfh  
XUfghY''h''

8]Y'; fi bX'U[ Y'ZØf'X]Y'YfZc'[ fY]W'Y'; YVi fh'k i fXY'Xi fW'Y]bY  
\_Øbgh]W'Y'6YgUa i b[ 'Ua' '&\*' 'A Āfn[ 'Y'Y[ h''8]Yg'j YfXYi h]W'hž'k ]Y  
k ]W'h][ 'a cXYfbY'ncc'c[ ]gW'Y'A Yh\cXYb'ZØf'X]Y'Ni W'h'i bX  
9f\U'hi b[ 'VYXfc\hYf'H]YfUfhYb'g]bX''8]Y'; YgW'YW'hYf'XYf  
Nk ]''b[ Y'g]bX'V]g\Yf'bcW' ]b]W'h'VYgh]a a h'k cfXYbž'UVYf'Yg' ]gh  
VY\_Ubbhž'XUgg'Yhk U'X]Y'< Ā'Zh'U''Yf'DUbXU!; YVi fhYb' ]b  
a YbgW' ]W'Yf'CV\ i h'Nk ]''b[ Y'g]bXž'k Ug' ]b]W'h'bi f'ZØf'X]Y'5fhž  
gcbXYfb'Ui W'ZØf'X]Y'5fVY]h'XYf'Nccg'j cb' [ fc» Yf'6YXYi hi b[ ' ]gh''

8]Y'5i Za Yf\_gUa \_Y]hž'X]Y'XYa 'BUW'k i W'g'ni hY]'k ]fXž'nY][ hž'k ]Y  
ghUf\_g]W'X]Y'; YgY''gW'UZh'ZØf'XYb'GW'i hn'VYXfc\hYf'H]YfUfhYb  
Yb[ U[ ]Yfh''8]YgYf'J cfZU'' ]gh'b]W'h'bi f'Y]b'NY]W'Yb'ZØf'XYb'9fZc'[

ncc`c[ ]gWYf`Ni W`hdfc[ fUa a Yž`gcbXYfb`Ui W`Y]b`k ]W`h[ Yg  
Gma Vc`ZØf`XYb`BUhi fgW`i hn`i bX`XUg`6Yk i gghgY]b`ZØf`X]Y`ZFU[ ]Yb  
² \_cgmghYa Yž`]b`XYbYb`X]Y`DUbXUg`YVYb"

## 9]b`6`]W`\_]b`X]Y`Ni \_i bZh

8]Y`; Ygi bX`X]Y]hi bX`XUg`K c`VYZ]bXYb`X]YgYf`bYi [ YVcfYbYb  
DUbXUg`k ]fX`k Y]hYf`]b`ØVYfk UW`hž`i bX`X]Y`Ncc!6Ygi W`Yf`\_ØbbYb  
Ui ZY]bY`gdUbbYbXY`9bhk ]W`\_i b[ ]]b`XYb`\_ca a YbXYb`A cbUHyb  
`cZYb"5b[ Yg]W`hg`XYf`<YfUi gZcfXYfi b[ Ybž`XYbYb`g]W`X]Y`; fc»Y  
DUbXU!5fh[ Y[ YbØVYfg]Y`hž`k ]fX`X]Y`YfZc`[ fY]W`Y`5i Zni W`h`XYf  
Nk ]`]b[ Y`j cb`[ fc»Yf`6YXYi hi b[ `ZØf`X]Y`ni \_ØbZh][ Y`Ni W`hi bX  
XYb`X]fY`\_hYb`9f`U`h`X]YgYf`Y]bn][ Ufh][ Yb`H]YfY`gY]b"9g`V`Y]Vh  
UVni k UfhYbž`k ]Y`g]W`X]Y`\_Y]bYb`DUbXUg`Ybhk ]W`\_Y`b`i bX`k Y`W`Y  
GW`f]hY`ni f`i: ØfXYfi b[ ]\fYf`5fh`k Y]hYf`]b`i bhYfbca a Yb`k YfXYb"

8]Y`; YVi fh`XYf`DUbXU!Nk ]`]b[ Y`]a`6Yf`]bYf`Ncc`]gh`b]W`h`bi f`Y]b  
YfZFYi`]W`Yg`9fY][ b]g`ZØf`X]Y`6Ygi W`Yfž`gcbXYfb`Ui W`j cb`[ fc»Yf  
6YXYi hi b[ `ZØf`XYb`]bhYfbUh]cbU`Yb`9f`U`hi b[ gncc!`i bX  
K ]`Xh]Yfa UbU[ Ya Ybh" `b`XYb`YhnhYb`]U`fYb`U`h`g]W`  
`YfUi g[ YghY`hž`XUgg`XYf`GW`i hn`XYf`; fc»Yb`DUbXUg`Y]bY  
\_ca d`Yi Y`<YfUi gZcfXYfi b[ `XUfghY`hž`X]Y`nU`fY]W`Y`dc`]h]gW`Y  
i bX`gcn]U`Y`8]a Ybg]cbYb`i a ZUggh"8]Y`DUbXUg`g]bX`U`g  
[ YZ`fXYh`Y]b[ Yghi Zhž`k Ug`VYXYi hYhž`XUgg`g]Y`j cf`Yfbgh`UZhYb  
6YXfc`i b[ Ybž`]bgVYgcbXYfY`Xi fW`@YVYbgfUi a j Yf`i gh`i bX`Y]bY  
[ Yf]b[ Y`i: cfhdZUbn i b[ gfUHyž`ghY`Yb"

8]Y`6Ya Ø`i b[ Yb`i a`XYb`9f`U`h`X]YgYf`H]YfUfh`UVYb`XU`Yf`b]W`h  
bi f`ncc`c[ ]gW`Yž`gcbXYfb`Ui W`X]d`ca Uh]gW`Y`5gdY`\_hY"7`]bU`U`h  
Xi fW`X]Y`gc`[ YbUbbhYb` DUbXU!8]d`ca Uh]Y`\_]b`XYb`YhnhYb  
]U`fnY`bhYb`k ]W`h[ Y`dc`]h]gW`Y`6Yn]Y`i b[ Yb`Ui Z[ YVUi hi bX  
ZØfXYfh`XYb`]bhYfbUh]cbU`Yb`5i ghUi gW`j cb`DUbXUg`ni f`Ni W`hi bX  
: cfgW`i b[ gnk YW`\_Yb"8Uni`[ Y`Øfh`Ui W`X]Y`Ni W`hcfXbi b[ ž`X]Y  
XUfUi ZUVn]Y`hž`[ YbYh]gW`Y`8]j Yfg]h`h`ni`ZØfXYfbž`k Ug`ZØf`XUg  
\_VYf`YVYb`XYf`5fh`YbhgW`Y]XYbX`]gh"8]Y`9f`U`hi b[ gdfc[ fUa a Y  
a ØggYb`dUfU`Y`ni f`GW`UZZi b[ ]cb`GW`i hn[ YV]YhYb`]b`7`]bU  
gck ]Y`]bhYfbUh]cbU`Yf`Ni gUa a YbUfVY]h[ Ygh`f`\_h`k YfXYbž`i a  
X]YgY`Y]bn][ Ufh][ Yb`H]YfY`ni`gW`ØhnYb"

8 ]Y`K ]W h][ \_Y]h j c b`Ni W h d f c [ f U a a Y b

8 ]Y`Ni W h d f c [ f U a a Y`Z0f` ; f c » Y`D U b X U g`g]b X`U`g`H Y ]`X Y f  
]b h Y f b U h]c b U`Y b`6 Y a 0\i b [ Y b`i a`5 f h Y b g W i h n`V Y g c b X Y f g`k ]W h][ "  
= b`a Y b g W`]W Y f`C V \i h [ Y V c f Y b Y`š b [ h]Y f Y`0 V Y f b Y \a Y b`Y]b Y  
G W`0 g g Y`f c`Y`]b`X]Y g Y b`D f c [ f U a a Y b`ž`X U`g]Y`ni f`9 f \ 0\i b [ `X Y f  
D c d i`U h]c b`V Y]h f U [ Y b`i b X`X U g`6 Y k i g g h g Y]b`Z0f`X Y b`G W i h n`X]Y g Y f  
H]Y f Y`g W`A f Z Y b`" 8 Y f`N c c`6 Y f`]b`g Y h n h Y`U i Z g c f [ Z`A`h][ Y`D`U b i b [ `i b X  
k ]g g Y b g W`U Z h]W Y`i b h Y f g h 0 h n i b [ ž`i a`X]Y`n 0 W`h Y f]g W Y`6 U g]g`ni  
j Y f g h`A f`\_Y b`i b X`X]Y`H f U [ k U`f g W Y]b`]W`\_Y]h`X Y f`D U b X U g`ni  
Y f \ 0\Y b`" 8 i f W` [ Y n]Y`h Y` : c f g W i b [ ž`j c f`U`Y a` ]b`X Y b`6 Y f Y]W Y b  
: c f h d Z U b n i b [ `i b X`5 i Z n i W h ž`\_ 0 b b Y b`N c c g`X U n i`V Y]h f U [ Y b`ž`X U g g  
X]Y`A`A X W Y b`i b X`š b [ Y b`]b`X Y f` : f Y ]\ Y]h`Y]b Y g`H U [ Y g`0 V Y f`Y V Y b  
\_ 0 b b Y b`"

9 g`g]b X`g d Y n]Y`Y`H f U]b]b [ g d f c [ f U a a Y`]a d`Y a Y b h]Y f h i k c f X Y b ž  
i a`X U g`b U h 0 f`]W Y g`J Y f \ U`h Y b`X Y f`D U b X U g`ni`Z0f`X Y f b`" 8 ]Y g Y  
D f c [ f U a a Y`g]b X`k ]W h][ ž`i a`g]W Y f n i g h Y`Y b`ž`X U g g`X]Y`H]Y f Y`V Y ]  
Y]b Y f`K ]Y X Y f Y]b Z0\ f i b [ `]b`X]Y`K ]`X b]g`U i Z ]\ f Y`b U h 0 f`]W Y b  
= b g h]b`\_h Y`ni f 0 W`[ f Y]Z Y b`\_ 0 b b Y b`" K ]g g Y b g W`U Z h`Y f` \ U V Y b  
\ Y f U i g [ Y Z`b X Y b`ž`X U g g`Y h k U` ) \$`D f c n Y b h`X Y f` ; Y V i f h Y b`]b`N c c g`V Y ]  
D U b X U g`N k ]`]b [ Y`g]b X`" 8 ]Y g`n Y][ h ž`k ]Y`k ]W h][ `X]Y` , V Y f k U W i b [   
i b X`i b h Y f g h 0 h n i b [ `]b`X]Y g Y a`g Y b g]V`Y b`N Y]h d i b`\_h`X Y f`5 i Z n i W h  
g]b X`"

6 Y X Y i h i b [ `X Y g`0 Z Z Y b h`]W Y b`= b h Y f Y g g Y g

8 Y f`0 Z Z Y b h`]W Y` : c`\_i g`U i Z`X]Y`k i f X Y`X i f W`X]Y` ; Y V i f h`X Y f`D U b X U  
N k ]`]b [ Y`]a`N c c`6 Y f`]b [ Y g h`A f`\_h ž`k U g`Z0f`j ]Y`Y`Y]b`V Y k`A`f h Y g  
A ]h h Y`]g h ž`i a`X U g`6 Y k i g g h g Y]b`Z0f`X Y b`5 f h Y b g W i h n`ni`g W`A f Z Y b`"  
8 ]Y`6 Y [ Y]g h Y f i b [ ž`X]Y`g c`W Y`9 f Y][ b]g g Y`U i g`0 g Y b ž`\_ U b b`ni`Y]b Y a  
g h`A f`\_Y f Y b`9 b [ U [ Y a Y b h`X Y f` ; Y a Y]b g W`U Z h`Z0f`X Y b`G W i h n`X Y f  
5 f h Y b j ]Y`Z U`h]b g [ Y g U a`h`Z0\ f Y b`" 8 ]Y`6 Y g i W Y f n U`Y b`]b`N c c g  
g h Y][ Y b`c Z h]b`N Y]h Y b`j c b`B U W`ni W h Y b`ž`k U g`k ]Y X Y f i a` ` ]`Z h ž  
Z]b U b n]Y`Y`A ]h Y`Z0f`X Y b`9 f \ U`h`X Y f`D f c [ f U a a Y`ni` [ Y b Y f]Y f Y b`"

Ni g`A h`]W`V]Y h Y b`N c c g`6`X i b [ g d f c [ f U a a Y`U b`ž`X]Y`X Y b  
A Y b g W`Y b`X]Y`@Y V Y b g k Y]g Y ž`6 Y X f c \i b [ Y b`i b X

9f\U`hi b[ gVYa Ø\i b[ Yb`bÅ\YfVf]b[ Yb"8]Y` ðhYfU\_h]cb`a ]h`H]YfYb  
]b`Y]bYa `Ncc!! a ZY`X`\_Ubb`ni XYa `XUg`A ]h[ YZØ\`i bX`XUg  
J YfUbhk cfhi b[ gVYk i gghgY]b`ZØf`XYb`GW`i hn`XYf`5fhYb`ZØfXYfb"

ð`Y]bYa `i a ZUggYbXYb`5bgUhn`VY[ Y[ bYb`Nccg`XYb  
<YfUi gZcfXYfi b[ Yb`XYf`5fhYf\U`hi b[ `Xi fW`6]Xi b[ ž: cfgW`i b[  
i bX`Ni W`h"8]Y`K ]YXYf\YfghY`i b[ `XYg`bUhØf`]W`Yb`@YVYbgfUi a g  
XYg; fc» Yb`DUbXUg`]b`7\]bU`]gh`XUVY]`Y]b`YVYbgc`k ]W`h][ Yf  
GW`f]hž`i a `XYa ` , VYf`YVYb`X]YgYf`5fh`Y]bY`Ub[ Zf]gh][ Y  
DYfgdY\_h]j Y`ni `V]YhYb"

8YhU]`g

6Ygi W`Yb`G]Y`i bg`Ui Z.`X]Y!bUW`f]W`hYb`"bYh