

8]YgYg`&\$!a]bØh][Y`<=H!@Ui ZhfU]b]b [VUi h`; YgWk]bX][_Y]h`]b `(`K cWkYb `Ui Z

9[U`žcV`G]Y`g]Wk`<U`g`ØVYf`?cdZ]bg`@Ui ZYb`j Yf`]YVYb`cXYf`Y\Yf`Y]b`; fY]nY]h`Ai ZYf`g]bXž`gY]bY`J cfhY]`Y`ZØf`XYb`[UbñYb`?ØfdYf`g]bX`i bVYghfY]hVUf`9g`_Ubb`b]Wk h`bi f`\Y`ZYbž`A`f`@YVYb`ni `j Yf`Àb[Yfbž`k Ybb`G]Y`Yg`ni `A`fYf`bcfa U`Yb`Fci h]bY`\]bni ZØ[Ybž`gcbXYfb`XUg`VYfØWk h][hY`F i bbYf`g`<][\`]gh`ni `%%\$`DfcnYbh`Y]bY`YWk h`GUWk Y``I`bX`Y]bYg`XYf`Wcc`ghYb`8]b[Y`Ua`@Ui ZYb`]ghž`XUgg`Yg`Y]Wk h`]ghž`J`Yf`VYggYfi b[Yb`]b`A`fYf`@Y]ghi b[`fUi Wk`VY`_Ubb`h`U`g`; YgWk]bX][_Y]h`ni `gY\Ybž`k Ybb`G]Y`g]Wk`ni `Y]bYf`_cbg]ghYb`hYb`Fci h]bY`j YfdZ]Wk`hYb`<]Yf`_ca`a h`Y]b`<=H!`@Ui ZhfU]b]b[`]bg`Gd]Y``8]Y`b`hY`fU]cb`j cb`\cWk]b`hY`b`g]j Ya`b`hY`fj U``h`fU]b]b[`]b`XYf`@Ui Zk`Y`h`U``[Ya`Y]b`U`g`; YgWk]bX][_Y]h`fU]b]b[`/`Ua`d`A`Y``]d/



9[U`žcV`G]Y`g]Wk`<U`g`ØVYf`?cdZ]bg`@Ui ZYb`j Yf`]YVYb`cXYf`Y\Yf`Y]b`; fY]nY]h`Ai ZYf`g]bXž`gY]bY`J cfhY]`Y`ZØf`XYb`[UbñYb`?ØfdYf`g]bX`i bVYghfY]hVUf`9g`_Ubb`b]Wk h`bi f`\Y`ZYbž`A`f`@YVYb`ni `j Yf`Àb[Yfbž`k Ybb`G]Y`Yg`ni `A`fYf`bcfa U`Yb`Fci h]bY`\]bni ZØ[Ybž`gcbXYfb`XUg`VYfØWk h][hY`F i bbYf`g`<][\`]gh`ni `%%\$`DfcnYbh`Y]bY`YWk h`GUWk Y``I`bX`Y]bYg`XYf`Wcc`ghYb`8]b[Y`Ua`@Ui ZYb`]ghž`XUgg`Yg`Y]Wk h`]ghž`J`Yf`VYggYfi b[Yb`]b`A`fYf`@Y]ghi b[`fUi Wk`VY`_Ubb`h`U`g`; YgWk]bX][_Y]h`ni `gY\Ybž`k Ybb`G]Y`g]Wk`ni `Y]bYf`_cbg]ghYb`hYb`Fci h]bY`j YfdZ]Wk`hYb`<]Yf`_ca`a h`Y]b`<=H!`@Ui ZhfU]b]b[`]bg`Gd]Y``8]Y`b`hY`fU]cb`j cb`\cWk]b`hY`b`g]j Ya`b`hY`fj U``h`fU]b]b[`]b`XYf`@Ui Zk`Y`h`U``[Ya`Y]b`U`g`; YgWk]bX][_Y]h`fU]b]b[`/`Ua`d`A`Y``]d/

J YfVYggYfi b[Yb']b' Δ fYf' @Y]ghi b['fUi W λ ' VY_Ubbh'U'g
; YgW λ k]bX][_Y]h λ 'ni 'gY\Yb λ 'k Ybb'G]Y'g]W λ 'ni 'Y]bYf'_cbg]ghYb λ Yb
Fci h]bY'j YfdZ]W λ hYb" \cdot <]Yf'_ca a h'Y]b' < \neq H!@Ui ZhfU]b]b[']bg'Gd]Y'"

8]Y' \neq hY[fUh]cb'j cb' \cW λ]bhYbg]j Ya' \neq hYfj U'`hfU]b]b['']b'XYf
@Ui Zk Y'h'U``[Ya Y]b'U'g'; YgW λ k]bX][_Y]hghfU]b]b['VYnY]W λ bYh'
_Ubb'Y]bY'j O``][Y'J YfAbXYfi b['XUfghY``Yb'' K λ \fYbX'GhYUXm!
GhUhY!@Ui ZYb' Δ fY'UYfcVY'? UdUn]hAh'Yf\O\h λ h'Yf\O\h
 \neq hYfj U'`hfU]b]b['Ui W λ ' Δ fY'UbUYfcVY'? UdUn]hAh'z'gU[h'<c``]g
Hi hhYzY]b'FF 75!nYfh]Z]n]YfhYf'GYb]cf!@Ui ZhfU]bYf']a' A]Y'<][\
Fi b'7'i VzY]bYa' @Ui ZVUbX!VUg]YfhYb'Ghi X]c']b'BYk'Mcf_7]hm"
8]YgYg'ni gAhn]W λ Y'HfU]b]b['k]fX'XUni'VY]hfU[Yb λ ' Δ f'<Yfn!
?fY]g'Ui ZlGmghYa'ni'j YfVYggYfb λ 'Yg'fcVi ghYf'ni'a UW λ Yb'i bX
a Y\ f'gUi YfgcZfY]W λ Yg'6'i h'Xi fW λ ' Δ fYb'? OfdYf'ni'di a dYb"
5i » YfXYa'k YfXYb' Δ fY'A i g_Y'b'Ui W λ 'VYggYf'XUf]b λ XUg
gUi YfgcZfY]W λ Y'6'i h'ni'bi hnYb" fG]Y'k YfXYb'X]YgY'J cfhY]`Y'Ui W λ
Xi fW λ 'XUg' < \neq H!HfU]b]b['Yfn]Y'Yb"'

\neq 6Yni ['Ui ZX]Y'@Y]ghi b['k]fX'Y]b' < \neq H!@Ui ZVUbXhfU]b]b['XUni
VY]hfU[Yb λ 'XUgg' Δ f'GW λ f]hh'YZ]n]Yb λ Yf'k]fX λ XU'g]W λ 'X]Y
?ccfX]bUh]cb'nk]gW λ Yb' Δ fYb'A i g_Y'b'i bX' Δ fYa' B Yfj YbgmghYa
j YfVYggYfh'k Ug'`Ui h'Hi hh'Y'k]W λ h][Y'5bdUggi b[Yb'ni f'GhY][Yfi b[
 Δ fYf'; YgW λ k]bX][_Y]h'a']h'g]W λ 'Vf]b[h'9bXYf[YVb]g.'G]Y' _ObbYb
X]Y'['Y]W λ Y'8]ghUbn']b' _ØfnYfYf'NY]h'Ui ZYb' ' \U'c'z'bYi Yf
dYfgOb']W λ Yf'F Y_cfx''

GY\Yb'G]Y'g]W λ 'i b λ Yb'XUg' < \neq H!@Ui ZhfU]b]b['j cb'Hi hh'Y'Ub λ 'XUg
@Ai ZYfb'XUVY]'`]Zh λ ']\fY'; YgW λ k]bX][_Y]h'ni'ghY][Yfb''G]Y'gU[h λ
XUgg'i b[YZA\ f'Y]b'8f]hh'Y' Δ fYg'k ØW λ Yb λ]W λ Yb'HfU]b]b[g'XYa
GW λ bY'')[_Y]hghfU]b]b[' [Yk]Xa Yh'gY]b'gc'`hY' ' j cfUi g[YgYhnh'G]Y
`Ui ZYb'* HU[Y'X]Y'K cW λ Y"K Ybb'G]Y'XUg'&\$!a]bØh][Y'< \neq H!
@Ui ZVUbXhfU]b]b['nk Y]a U'k ØW λ Yb λ]W λ 'ZØf'j]Yf
Ui ZY]bUbXYfZc'[YbXY'K cW λ Yb'UVgc'j]Yfh'\UVYb λ k ØfXYb'G]Y'V]g
ni a 'A c b UhgYbXY'XYZ]b]hjj'Y]bY'J YfVYggYfi b[' Δ fYf') !_a !NY]h
ZYghghY``Yb" fI bX'g]Y\ 'X]f'X]YgY'j YfgW λ]YXXbYb'5fhYb'j cb' \neq hYfj U'!
@Ui ZhfU]b]b[g'Ub λ 'k Ybb'Xi' Yg'AbXYfb'a ØW λ hYgh"'

6Yj cf'G]Y'a']h Δ fYa' < \neq H!HfU]b]b['Ui ZX]Y' @Ui ZVUbX'VY[]bbYb λ

gWÀ`À[h`Hi hh`Y`j cfž`XUgg`G]Y`Y]bY`[i hY`J cfghY`i b[`XUj cb`\UVYbž
k Ug`Àf`\UfhYf`@Ui ZfKYb_Yb`G]Y`Ub`) _a Łž< U`Va UfUh\cb!`i bX
A UfUh\cbhYa dc`g]bXž`XUa]h`G]Y`ÀfY`k U\f[Ybca a YbY
5bghfYb[i b[gfUhY`ff D9Ł`k À\ fYbX`XYg`HfU]b]b[g`VYggYf
Y]bgWÀhnYb`_ØbbYb`6Y]gd]Y` J]Y`Y]WÀh`Ài Zgh`Xi`Y]bYb`) !_a !
@Ui Z]b`Y]bYa`HYa dc`j cb` , . \$`I \fž`Y]bYb`< U`Va UfUh\cb`i a
- . \$`I \f`i bX`Y]bYb`j c`Yb`A UfUh\cb`a]h`%\$!A]bi hYb!A Y]`Yb`

C\ži bX`k Ybb`@Ui ZVUbX`Ui ZYb`b]WÀh`Àf`8]b[`]ghž`_ca a Yb`G]Y
b]WÀh`]bg`GWÀk]hnYb`8]YgY`Fci h]bY`_Ubb`Ui WÀ`dfcV`Ya`cg`ja
: fY]Yb`Xi fWÀ[YZØ\fh`k YfXYb`G]Y`a ØggYb`bi f`Y]b`k Yb][
fY_cbgħfi]YfYbž`i a`XYb`f]WÀh`[Yb`<Ø[Y`ni`Z]bXYb`fl`bX`Y]bY
@Ui Z`\f`a]h`Y]bYa`<Ø\Yba YggYf`UVYbž`XYf`X]Y`<Ø\Y`a]għħž`k]Y
X]Y`5dd`Y`K UhWÀ`GYf]Yg`cXYf` Ufa]b` cfYfi bbYf`*(`) `A i g]WŁ"
I a`X]Y`GħY`[i b[`fK`]b`_Y`XYf`GħY`[i b[`Y]bYg`<Ø[Y`g`ni
VYgh]a a Ybž`hY`gh`Xi`X]Y`GħY`[i b[`Xi`fWÀ`X]Y`5VZU\fh`Ni a
6Y]gd]Y` K`Ybb`XYf`5bgh]Y`) \$`i »`ØVYf`Y]bY`GħfYW_Y`j`cb`) \$\$
: i »`VYħfÀ[hž`k ĄfY`XUg`) \$#` \$\$`cXYf`\$ž%`Y`i]j U`Ybh`ni`Y]bYf
%%`dfcnYbh`[Yb`GħY`[i b[`fk`Ug`ØVf`[Ybg`Y]b`ghY`Yf`5bgh]Y`[`]ghħe`
9]b`5bgh]Y`j`cb`%&` : i »`ØVYf`X]Y`[`Y]WÀY`8]ghħUbn`j`cb`) \$\$`i »
f%`\$` \$\$`L`Yf`[]Vh`Y]b`9f`YVb]g`j`cb`\$ž`&(`cXYf`&ž`DfcnYbh
GħY`[i b[``GcVU`X`G]Y`Y]b`dUUf`[fc`Ufh`[Y`6YbWÀa`Uf_g`]b`ÀfYf
BÀ\Y`[YZ`bXYb`UVYbž`g]bX`G]Y`ZØf`YXXg`HfU]b]b[`Ub`XYf`Zf]gWÀYb
@ Zh`j`b`XYf`Ni`_i`bZh`[YfØghYh`fWÀ`a`i gg`U`YfX]b[g`gU`Ybž`XUgg
X]YgY` \$!hÀ[][Y`@Ui ZVUbXI`<YfUi għcfXYfi b[`hUhgħÀWÀ`]WÀ`GdU»
a`UWÀh`

````&\$!a` ]bØh]`Yg`<=H`@Ui ZVUbX!K` cf\_ci h`

Àf`N]Y`]b`XYf`YfghYb`<À`ZhY`X]YgYg`<=H`@Ui ZhfU]b]b[ g`]gh`Ygž  
k`À\ fYbX`XYg`[ YgUa`hYb`HfU]b]b[ g`X]Y`[ `Y]WÀY` ;`YgWÀk`]bX`[ \_Y]h  
VY]a`Y]WÀhYb`>[ [ Yb`VY]ni`VY\U`hYb`i`bX`[ `Y]WÀnY]h`[ `X]Y  
GħY`[ i b[ `ni`Yf\Ø\Yb`ž`gU`h`Hi hh`Y` ?`cbnYbhf]YfYb`G]Y`g]WÀ  
XUfUi Zż`Y]bYb`ZYghYb`?Yfb`VY]ni`VY\U`hYbž`k`À\ fYbX`G]Y`X]Y`?b]Y  
bUWÀ`cVYb`i`bX`X]Y`5fa`Y`bUWÀ`\]bħYb`VYk`Y`[ Yb`Y`ghY`Yf`X]Y  
GħY`[ i b[ ž`XYghc`[ fØ»Yf`XYf`5bhf]YV`8]Yg`k`]fX`g]WÀ`]b

; YgWX k ]bX][ \_Y]h'b]YXYfgWU[ Ybžk Ybb'G]Y'k ]YXYf'Ui Z'VYbYa  
6cXYb'g]bX"

< ]bk Y]g' 9g'[ ]Vh'Y]bYb'I b hYfgW ]YX'nk ]gWX Yb'XYb' ]a' <=H!  
@Ui ZVUbXhfU]b]b[ 'Ui Z[ YZØ\ fhYb'HYa dcg' 'Y]WX hYg' &[ [ Yb' i bX  
9f\c'i b[ "K Ybb'G]Y'k A\ fYbX'X]YgYf'9f\c'i b[ gd\UgYb  
gdUn]YfYb'[ Y\Yb'a ØWX hYbžhi b'G]Y'X]Yg"8]Y'9f\c'i b[ gd\UgY'gh  
k ]f\_']WX U``Ygžk Ug'G]Y'VfUi WX Ybži a 'XUg'; YZØ\ ``ni 'UVYbžXUgg  
G]Y'VYfY]h'g]bXžXUg'bAWX ghY'bhYfj U``]b'j c``Yb'NØ[ Yb'ni  
a Y]ghYfb"8Ug``Y]WX hY' &[ [ Yb'\b]b[ Y[ Yb'gc``hY'g]WX gc'UbZØ\`Ybž  
U'g'k ØfXYb'G]Y'g]WX' ]a a Yf'bcWX'Ui Z'b]YXf][ Ya' B]j YUi  
UbghfYb[ Yb'"

I b[ YZA\ f'bUWX'XYf' < A'ZhY'XYg' < =H! @Ui ZVUbXhfU]b]b[ g'YffY]WX Yb  
G]Y'X]Y'UVghY][ YbXY'; YgWX k ]bX][ \_Y]hg'Y]hYf"8cfh'VYghY\h'XUg  
N]Y``XUf]bžX]Y'; YgWX k ]bX][ \_Y]h'ni 'Yf\ Ø\Yb'f\$%z\$'a d\  
\]bni ni ZØ[ Ybžk Ybb'X]Y'bhYfj U``nY]h'UVb]a a h' K Ybb'G]Y  
gWX bY``Yf'k YfXYbžgdUbbYb'G]Y' A'fYb'?Yfb'Ubži a 'X]Y'8fY\i b[  
XYg'CVYf'\_fdYfg'ni 'fYXi n]YfYbži bX'Yf\ Ø\Yb'G]Y'XYb'?b]Y! i bX  
5fa Ubhf]YV žgU[ h'Hi hh'Y" I bX'bUWX XYa'G]Y'X]Y'i bg]WX hVUfY  
N]Y``]b]Y' A'fYg' < =H! @Ui ZVUbXhfU]b]b[ g'ØVYfei Yfh'UVYb'i bX  
k ]YXYf'ni '5hYa' \_ca a Ybžj Yf[ YggYb'G]Y'b]WX hžg]WX'ni 'XY\bYb'"

75 H@B!A 5F =9'A =B 9F 'C B;

8 YhU]`g

6Ygi WX Yb'G]Y'i bg'Ui Z'a Y]b!Z]hb Ygg"bYh