

## ?\ib'?cfb'K UggYfZU``k UbXYfi b[']b 7\]Ub['FU]' '6YghYf'K UggYfZU``']b H\U]`UbX3

8]Y?\ib?cfb'K UggYfZU``k UbXYfib[']gh'Y]bY'\_i fnY
K UbXYfib['XifW.'Y]b'8gW\ib[Y`hU`ni'Y]bYa'XYf

VYY]bXfi W\_YbXghYb'K UggYfZA``Y'H\U]`UbXg"'8Yf'K UggYfZU``
?\ib'?cfb'`]Y[h'bif'Y]bY'\_i fnY: U\fh'j cb'H\U]`UbXg

b`OfX`]W\ghYf'GhUXh'7\]Ub['FU]'YbhZYfbh"'A Y]bYf'A Y]bib[
bUW\']gh'XYf'6Ygi W\'X]YgYg'K UggYfZU``g'Y]bY'XYf'VYghYb

5\_h]j ]h\hYb']b'7\]Ub['FU]"'HUhg\hX\`]W\'k Uf'XYf'6Ygi W\
X]YgYg'K UggYfZU``g'Y]bYf'XYf'<Ui dh[f\ØbXY\z'k Ufia']W\'a]W\
YbhgW\]YX\z'\hb[Yf']b'XYf'GhUXh'ni'V`Y]VYb"'Bibz'XUg'ibX'XYf

5i gg]W\hgdib\_h'D\i'7\]: U\z'\ØVYf'XYb'G]Y'\]Yf'`YgYb'\_\ObbYb"

6i W\Yb'G]Y'\hat\fY'FY]gY'bUW\'7\]Ub['FU]'; \Øbgh][Y': '\Ø[Y\Vi W\YbG]bX'G]Y'bcW\']b'XYf'D`Ubib[gd\UgY'\hat\fYf'FY]gY3

8YfnY]h']gh/ Uad\\Y``]d/

8]Y?\ib?cfb`K UggYfZU``k UbXYfi b[']gh'Y]bY'\_i fnY`K UbXYfi b[Xi fW\Y]b`8gW\ib[Y`hU``ni 'Y]bYa 'XYf'VYY]bXfi W\_YbXghYb
K UggYfZ\``Y`H\U]`UbXg"8Yf`K UggYfZU``?\i b'?cfb``]Y[h'bi f'Y]bY
\_i fnY:: U\fh'j cb`H\U]`UbXg'b\OfX`]W\ghYf`GhUXh'7\]Ub[ 'F U]'YbhZYfbh"
A Y]bYf`A Y]bi b[ 'bUW\']gh'XYf`6Ygi W\'X]YgYg'K UggYfZU``g'Y]bY'XYf
VYghYb'5\_h]j ]h\AhYb']b'7\]Ub[ 'F U]"'HUhg\AW\`]W\'k Uf'XYf'6Ygi W\
X]YgYg'K UggYfZU``g'Y]bYf'XYf'<Ui dh[f\ØbXY\Z'k Ufi a ']W\'a ]W\
YbhqW\]YX\Z'`\Ab[Yf']b'XYf'GhUXh'ni 'V`Y]VYb"

Bi bž'XUg'i bX'XYf'5i gg]W\hgdi b\_h'D\i '7\]': Už'ØVYf'XYb'G]Y'\]Yf `YgYb'\_ÒbbYb"

6i WX Yb 'G]Y ' $\Rightarrow$  fY 'F Y]gY 'b UWX '7\]Ub[ 'F U]

;  $\emptyset bgh][Y': MYbG]bX'G]Y'bcW']b'XYf'D`Ubi b[gd\UgY' \Rightarrow fYf)$ 

 $FY[qY3.8YfnY]h^{-}[qh^{-}XYf^{-}VYqhY^{-}ibX^{-}Y]b^{-}ZUWXqhY^{-}K^{-}Y[z^{-}[\varnothing bqh][Y^{-}: ^{\infty}[Y]b^{-}ZUWXqhY^{-}K^{-}Y]$ ni Z|bXYbžX]YJYfkYbXib[jcbAcacbXcibXG\_mgWUbbYf" Nk ]gWXYb XYb VY]XYb Z|bXYb G]Y [ UfUbh]Yfh ]a a Yf XYb  $[\emptyset bgh][ghYb: `i[\check{z}:\emptyset VYfU```UiZ'XYf'KY`h"`6iWXYb'G]Y`=\fY$ I bhYf\_i bZhC V G Y bUWX < cghY gž < chY gž DY bg cbYb cXYf FYgcfhqnk ]gWXYb 6cc\_]b[ "Wca i bX 5[ cXU gi WXYbž G]Y Yf\U`hYb ]a a Yf X]Y'VYghYb'5b[YVchY"'9]bY'[fc»Ufh][Y':ib\_h]cb']gh' GYUfWX'6m A Ud  $\check{z}$ 'a  $]h'XYf'G]Y'Y]bY'I bhYf_i b<math>Zh']b'XYf'BA\Y'XYf'? \setminus i b'?cfb!$ K UggYfZU``k UbXYfi b[ 'Z]bXYb'\_ObbYb"'A UbWa U`ž'k Ybb']W\'Yhk Ug `Àb[Yf'Ub'Y]bYa 'Cfh'V`Y]VYb'a ÒW\hYž'bi hnY']W\'5]fVbV"'Hci fYb ibX:HfUbgdcfh:ViWXYbG]Y:k ]ggYb:VYfY]hgž:XUgg:]WX:ibUV\Ab[][Yg FY]qYb'VY| cfni [Y"'A UbW\a U`']qh'Yq'XYf'VYqhY'i bX'V]``][ ghY'K Y[ž 8 ]b [ Y 'ni 'Y f`Y X ][ Y b ž Y ]b ZUWX 'Y ]b Y 'Hci f 'c X Y f 'Y ]b 'DU\_Y h 'ni 'V i WX Y b " : Øf'H\U]`UbX'| Yfk YbXY']W\']a a Yf'? `cc\_'i bX'J ]Uhcf"'I a  $[\emptyset bgh][YfY'JYf_Y\fga]hhY`]b'H\U]`UbX'k]Y'6igqYž'N\emptyset[Y'ibX$ : À\fYb ni 'Z|bXYbž'\_ÒbbYb 'G]Y 'Ui W\ '%&; c5g]U 'VYgi W\Yb" 5VYbhYi YffY]qYj Yfq]WXYfi b[ 'b]WXh'j Yf[ YgqYb'K Ybb'G]Y'X]YqYb 6c[ YqYbz'qiWYb'G]Y'kUfqWXY]b']WYYfbUWX'5VYbhYiYfb'VY]Y]bYa 'GW\`i W\_'Ua 'Dcc`"'BUW\XYa 'a ]f']b'6UfW\`cbU'a Y]bY [YgUa hY'HUgWXY'[Yghc\`Yb'kifXY'fY]bgWX`]Y»`]WX ?Ua YfUUi gfØghi b[Łž'\UVY']WX'[YgWk cfYbž']a a Yf'Y]bY  $FY[qY|Yfq]WXYfib['ni'\UVYb"'AY]bY'VY]XYb'@|YV`]b[gcdh]cbYb'ZØf$ 5VYbhYi YffY]qYbXY'q]bX'GUZYhmK ]b['i bX'K cf'X'Bca UXg"'?`]W\_Yb  $G[Y']Yf\check{z}ia XYbJYf[Y]WXnk]gWXYbXYbVY]XYbniYgYb"$ 

K ]Y '\_ca a h'a Ub 'ni a '? \i b '? cfb
K UggYfZU``3'

8 U'X]Y'K UbXYfi b['ni a '?\i b'?cfb'K UggYfZU``Yhk Ug'Ui »Yf\U`V XYf'GhUXh'`]Y[hž'[]Vh'Yg'b]W\h'j]Y`Y'GhUbXUfX!FY]gY[fi ddYbž'X]Y X]YgYb'K UggYfZU``'VYgi W\Yb"'5V[YgY\Yb'XUj cb'[]Vh'Yg'Y]b][Y fi ddYbž'X]Y'\]Yf'U`g'ni gÀhn`]W\Yb'Ghcdd'Ua '9bXY'Y]b][Yf'7\]Ub[FU]!HfY\_\_]b[hci fYb'j cfVY]gW\Ui Yb"

±0.5bVYhfUW\h`XYggYb`]gh`XYf`VYghY`K Y[žia inia i5ig[Ub[gdib\_h XYg`?\ib`?cfb`K UggYfZU``k UbXYfk Y[g'ni i[Y`Ub[YbžY]b`A chcffUX]b`7\]Ub[`FU]'ni ia ]YhYb`i bX`gY`Vgh`\]Yf\Yf`ni 'ZU\fYb"

 $= f'N]Y'']gh'XYf'K U'XdUf_'? ib'?cfbž'XYf'Yhk U'($'A]bi hYb'j cb XYf'GhUXh'7 i]Ub['FU]'YbhZYfbh'']Y[h''8]Y'5bfY]gY']gh'n]Ya `]WXY]bZUWXž'k Ybb'G]Y'XYa '; cc['Y'A Udg!D]b'i bhYb'Zc`[Yb''$ 

G]Y'a ØggYb'VYXYb\_Ybž'XUgg'X]Y'YfghY'GhfYW\_Y'XYf': U\fh'Ui Z'ghUf\_VYZU\fYbYb'GhfU» Yb'j Yf`Ài Zhž'XU\Yf']gh'Yg'Y]b'A i ggž'Ui Z'Y]bYa A chcffUX'Ui Z'h\U]`ÀbX]gW\Yb'GhfU» Yb'g]W\Yf'ni 'gY]b"'BUW\'Yhk U' \$'A]bi hYb': U\fh'V]Y[Yb'G]Y'Ui Z'Y]bY'\_i fj YbfY]W\Y': cfghghfU» YUVž'XYf'G]Y'V]g'ni a '9bXY'XYf'GhfU» Y'Zc`[Yb'a ØggYb"

<]Yf'gY\Yb'G]Y'Y]bYb'[fc>Yb'DUf\_d`Uhn'i bX'Y]b'i f][Yg'\_`Y]bYg
FYghUi fUbhž']b'XYa 'G]Y'bUW\'XYf'K UbXYfi b['?fUZh'hUb\_Yb
\_`ObbYb"'8Yf'5i g[Ub[gdi b\_h'ZØf'X]Y'K UbXYfi b['ni a '?\i b!?cfb!
K UggYfZU```VYZ]bXYh'g]W\'Yhk U') \$'A YhYf'j cb'X]YgYa 'DUf\_d`Uhn
YbhZYfbh'i bX']gh'Xi fW\'Y]bY'\_`Y]bY'Ui g[YgW\]`XYfhY'K U`XÔZZbi b[
[Y\_YbbnY]W\bYh"

 $?U'U_hcif'UiZ'XYa': igg'?c_.'9]bYg'XYf'VYghYb': iggYf`YVb]ggY']b\\7\]Ub['FU]ž'\]Yf'ViWXYb''$ 

## 9]bhf]hhg[YVØ\f'ZØf'XYb'?\ib!?cfb! K UggYfZU``'&\$&\$

5V \*Jbi Uf \*&\$&\$ `]gh XYf `9]bhf]hh `ni a `?\i b `?cfb `K UggYfZU`` \_cghYb`cg" `8]Yg `VYXYi hYhž XUgg `X]YgY `K UggYfZU``k UbXYfi b[ `b]W\h bi f Y]bY `XYf `VYghYb `5\_h]j ]hÀhYb `]b `7\]Ub[ `F U] `]ghž gcbXYfb `Ui W\\_cghYb`cg°

U`h1 ? < I B '? C F B 'K 5 G G 9 F : 5 @ 7 < -5 B ; 'F 5 = 2

## 8]Y?\ib?cfbKUggYfZU``kUbXYfib[

GcVU`X'G]Y'XYb'5i g[Ub[gdib\_h'YffY]W\h'\UVYbž']gh'Yg'bi f'Y]bY \_i fnY'%)!?]`ca YhYf!K UbXYfi b[ž'V]g'G]Y'XYb'K UggYfZU`` YffY]W\Yb"8Yf'K Y[']gh'fY`Uh]j 'Z'UW\'i bX'ZØ\fh'Ub'\cW\
Ui ZfU[YbXYb'6Ua Vi gk À`XYfb'i bX'j YfghfYi hYb'6UbUbYbghUi XYb
j cfVY]"

5a '9bXY'XYg'DfcnYggYg"'G]Y'a ØggYb'Y]bYb'gWkbY``Yb'5i Zgh]Y[ni a 'HU`VcXYb'a UWkYbž'k c'G]Y']b'i bX'i bhYf'XYb'K UggYfZU``'i bXXUg'ZUWkY'GWk ]a a VYW\_Yb'[Y`Ub[Yb'\_ObbYb"

- 'U`h1 65A6| G'5|: '89A'?<| B'?CFB': CF9GH'D5F? HF57?'7<=5B; 'F5=2
- 'U`h1 ?<IB'?CFB':CF9GH'D5F?'HF57?'7<=5B; 'F5=2

A 9< F'@9G9B'7< =5B; 'F5='K 5GG9F: Y'@9.'< i Um'? UYk 'K UggYfZU``' / 'A UY'GU]'K UggYfZU``'

## H\U]`UbXg'VYY]bXfi W\_YbXghYf'K UggYfZU``3'

9g'VYghY\h'\_Y]b'Nk Y]ZY`ž'XUgg'XYf'K UggYfZU``'?\i b'?cfb'Y]bYf'XYf VYY]bXfi W\_YbXghYb'K UggYfZÀ``Y'H\U]`UbXg']gh"'8Yf'f]Yg][Yž'+\$ A YhYf'h]YZY'K UggYfZU``'fY]» h'Xi fWX 'XUg'cVYfY'8gWXi b[Y`d`UhYUi i bX'ghØfnh']b'Y]b'ZUWXYgž'UVYf'gWXk]a a VUfYg'GØ» k UggYfVYW\_Yb"

5a :: i » 'XYg'K UggYfZU``g'[]Vh'Yg'Y]bYb'Z]Y» YbXYb'5VZi ggž'XYf g]W\'i a 'a Y\fYfY'[fc» Y': Y`gVfcW\_Yb'k]bXYh'' K]f'gU» Yb'i b[YZÀ\fY]bY'Ghi bXY'\]Yfž'[YbcggYb'X]Y'GnYbY'i bX'j Yfgi W\hYbž'Y]b'dUUf 5i ZbU\a Yb'ni 'a UW\Yb"

5V\Àb[]['jcb'XYf'\J\fYgnY]h'\_ÒbbhY'XYf'K UggYfZU``?\ib'?cfb a Ò[`]W\Yfk Y]gY'ni 'Y]bYa '[YZÀ\f`]W\Yb'Cfh'ZØf'Y]bYb'6Ygi W\k YfXYbž']bgVYgcbXYfY'bUW\'ØVYfa À»][Yb'FY[Yb[ØggYb"'G]Y a ØggYb'gY`Vgh'YbhgW\Y]XYbž'cV'G]Y'\]Yf'gW\k]a a Yb'\_ÒbbYb'cXYfb]W\h"

U`h1 ? < | B ? C F B `K 5 G G 9 F : 5 @ 7 < -5 B ; `A 5 = H < 5 = Ø 5 B 8 2
U`h1 ? < | B ? C F B : C F 9 G H D 5 F ? `K 5 G G 9 F : 5 @ 7 < -5 B ; `A 5 = 2 6`] W\_U i Z X Y b `K Ugg Y f Z U```? \ i b ? c f b `i b X `X Ug '9 b X Y `X Y f K Ub X Y f i b [

, 69FB57<H9B 'I BH9F?IB: HG: , < F9F

 $A Y]bY'I bhYf_i bZh']b'7 \] Ub['A U]. ; fUWY' < cghY'; fUWY' < cghY''k Uf hUhgÀW\']W\'Y]bYg'a Y]bYf'@]YV']b[g\cghY`g']b'BcfXh\U]'UbX"'8 Ug _cghYb`cgY': fØ\ghØW_']gh'[fc> Ufh]["'CVk c\''Yg'Yhk Ug'Ui > Yf\U'V XYg'GhUXhnYbhfi a g'`]Y[hž'_Ubb'XYf'ZfYi bX`]W\Y'6Yg]hnYf'G]Y _cghYb`cg'ni 'XYb'A Àf_hYb'cXYf'ni a '6i gVU\b\cZ'ZU\fYb"$ 

<cWX 'VYk YfhYhYg'; ÀghY\Ui g. 'Gi UbHi b['; i Ygh'< ci gY'8]Yg']gh
Y]bYg'XYf'VYghVYk YfhYhYb'6i X[Yh!; ÀghY\Ài gYf']b'7\]Ub['FU]"'9g
]gh'gi dYf'nYbhfU`ž'bi f'k Yb][Y'; Y\a]bi hYb'j ca 'BUW\ha Uf\_h'i bX
XYa 'I\fhi fa 'i bX'XYf'6i g\U`hYghY``Y'YbhZYfbh"</pre>

; Øbgh][ ghYf'GWX`UZgUU``]b'7\]Ub[ 'FU].'6Uf'%, ('DUfhm'<cghY`6Uf
%, ('\Uh'GWX`UZgÀ`Y'ZØf'i bhYf'`) 'dfc'BUWXhž'k Ug'XYf'V]``][ ghY']ghž
XYb'G]Y']b'7\]Ub[ 'FU]'Z]bXYb'k YfXYb"'K Yf'DUfhmgh]a a i b[ 'ni
Y]bYa '[ Øbgh][ Yb'DfY]g'gi WXhž']gh'\]Yf'[ YbUi 'f]WXh][ "'8]YgY'¾ b[ g
cf[ Ub]g]YfYb'Ui WX'A chcffÀXYfž'k Ybb'G]Y'a ÒWXhYbž'XUgg'G]Y'a ]h
Y]bYa 'ni a '?\i b'?cfb'K UggYfZU``ZU\fYb"</pre>

; YZÀ``h'\bYb'X]YgYf': Ø\fYf'ni f'?\i b'?cfb'K UggYfZU``k UbXYfi b[
]b'7\]Ub['A U]ž'H\U]`UbX3'K Ybb'G]Y'bUW\'k Y]hYfYb'FY]gYZØ\fYfb
ZØf'7\]Ub['A U]'gi W\Ybž'k À\`Yb'G]Y'Ui g'XYf'@]ghY'i bhYb''K Ybb'G]Y
a Y]b'@]YV`]b[gYf`YVb]g'k c``Ybž'gW\Ui Yb'G]Y'g]W\'XYb
5i gg]W\hgdi b\_h'D\i '7\]': U'Ub'

'U`h1 ?\i b'?cfb'K UggYfZU``k UbXYfi b[']b'7\]Ub['FU]' '6YghYf K UggYfZU``']b'H\U]`UbX3 2

8 Y hU]`g

6 Ygi WX Yb 'G]Y i bg 'Ui Z 'Y]bY!fY]gY "XY