



<YggYbžY]b 6i bXYg`UbX]b XYf A]hhY 8 Yi hgWX`UbXgž'V]YhYhY]bY
J]Y`nU\``j cb 5_h]j]hÀhYb ii bX II bhYfbY\a i b[Yb ZØf'YXYb
; YgWXa UW_"J cb a U`Yf]gWXYb BUhi fdUf_g ii bX K UbXYfk Y[Yb V]g
\]b ni 'ZUgn]b]YfYbXYb _i `hi fY``Yb GhÀhhYb ii bX UVYbhYi Yf`]WXYb
: fY]nY]ha Ò[`]WX_Y]hYbžX]Y FY[]cb \Uh ZØf B Uhi f`]YV\UVYfž
?i `hi f]bhYfYgg]YfhY ii bX 5XfYbU`]b! ii b_]Yg [`Y]WXYfa U ii Yb Yhk Ug
ni 'V]YhYb" ib X]YgYa '5fh]_Y``k YfXYb X]Y hcd!5_h]j]hÀhYb]b < YggYb
ZØf B Uhi f`]YV\UVYfž_i `hi fY``Y'9bhXYW_i b[Yb ii bX UVYbhYi Yf`]WXY
I bhYfbY\a i b[Yb ZØf 5XfYbU`]b! ii b_]Yg j cf[YghY``h" HUi WXYb G]Y
Y]b]b X]Y j]Y ZÀ`h][Y K Y`h'j cb < YggYb ii bX YbhXYW_Yb G]Y X]Y
GWX ÀhnYžX]Y X]YgYg'6i bXYg`UbX ni 'V]YhYb \Uh"</pre>

Hcd!5_h]j]hÀhYb]b < YggYb ZØf BUhi f`]YV\UVYf

<YggYbžY]b'6i bXYg`UbX']a '<YfnYb'8Yi hgW\`UbXgž'V]YhYhYY]bY
J]Y`nU\`'j cb'5_h]j]hÀhYb'ZØf'BUhi f`]YV\UVYfž'X]Y'X]Y'i bVYfØ\fhY
GW\`Ob\Y]h'XYf'BUhi f'[Yb]Y»Yb'a OW\hYb"'Jcb'a U`Yf]gW\Yb
K UbXYfk Y[Yb'V]g'\]b'ni ']Xm``]gW\Yb'GYYb`UbXgW\UZhYb'[]Vh'Yg']b
<YggYb'nU\`fY]W\Y'A O[`]W_Y]hYbž'X]Y'BUhi f']b']\fYf'[UbnYb
DfUW\h'ni 'Yf`YVYb"</pre>

9]bY'XYf'VY`]YVhYghYb'CihXccf!5_h]j]hÀhYb']b'< YggYb']gh
K UbXYfb"'8 Ug'6i bXYg`UbX'j YfZØ[h'ØVYf'Y]b'[ih'Uig[YVUihYg
K Y[YbYhnž'XUg'K UbXYfYf'XifW\'a U`Yf]gW\Y'K À`XYfž'Ybh`Ub[
fUigW\YbXYf': `ØggY'ibX'ni'UhYa VYfUiVYbXYb'5igg]W\hgdib_hYb
ZØ\fh"Ni'XYb'Hcd!K UbXYfk Y[Yb']b'< YggYb'nÀ\`Yb'XYf'VY_UbbhY
F\Y]bghY][ž'XYf'Jc[Y`gVYf[Yf'<Ò\Yb!GhY]['ibX'XYf

: Øf'X]Y Yb][Ybž'X]Y ``]YVYf'Ui Z'nk Y] F ÀXYfb'i bhYfk Y[g'g]bXž'V]YhYh
< YggYb'Ui W\'nU\`fY]W\Y'FUXk Y[Yž'X]Y'Xi fW\'UVk YW\g`i b[gfY]W\Y
@UbXgW\UZhYb'ZØ\fYb"'Jcb'[Ya Øh`]W\Yb'Hci fYb'Ybh`Ub['XYf
: `ØggY'V]g'\]b'ni 'Ubgdfi W\gj c``Yb'A ci bhU]bV]_Y!GhfYW_Yb']gh'ZØf
YXYb'FUXZU\fYf'Yhk Ug'XUVY]"'Ni 'XYb'VY`]YVhYghYb'FUXk Y[Yb']b
< YggYb'[Y\ ÒfYb'XYf'@U\ bhU`!FUXk Y[ž'XYf'Ji `_UbfUXk Y['i bX'XYf'
9XYf!FUXk Y["</pre>

BYVYb'K UbXYfb'i bX'F UXZU\fYb'V]YhYh'< YggYb'Ui W\'Y]bY'J]Y`nU\`j cb'K UggYfgdcfha Ò[`]W_Y]hYb"'8]Y'a U`Yf]gW\Yb'GYYb'XYg 6i bXYg`UbXYg'`UXYb'ni a 'GW\k]a a Ybž'6cchZU\fYb'i bX'5b[Y`b Y]b"'Ni 'XYb'Hcd!GYYb']b'< YggYb'nÀ\`Yb'XYf'9XYfgYYž'XYf 8]Ya Y`gYY'i bX'XYf'G]`VYfgYY"

: Øf B Uhi f`]YV\UVYfž X]Y [YfbY H]YfY VYcVUW hYbž []Vh Yg]b
< YggYb 'Ui W 'nU\ `fY]W Y H]YfdUf_g i b X 'K]`XdUf_gž]b 'XYbYb
\Y]a]gW Y i b X YI ch]gW Y H]YfUfhYb \Ui hbU\ 'Yf YVh k YfXYb
_ ObbYb "'Ni 'XYb 'VY`]YVhYghYb 'H]YfdUf_g ']b '< YggYb '[Y\ OfYb 'XYf
K]`XdUf_ '5 `hY : UgUbYf]Y ']b '< UbUi ž XYf C dY`!Ncc ']b '? fcbVYf['i b X
XYf 'K]`XdUf_ '8 cbgVUW "</pre>

±g[YgUa h'V]YhYh'<YggYb'Y]bY': Ø``Y'j cb'5_h]j]hÀhYb'ZØf BUhi f`]YV\UVYfž'X]Y'X]Y'J]Y`ZU`h'i bX'GW\Òb\Y]h'XYf'BUhi f']b'j c``Yb NØ[Yb'[Yb]Y»Yb'a ÒW\hYb"'9[U``cV'VY]a 'K UbXYfbž'FUXZU\fYbž K UggYfgdcfh'cXYf'H]YfVYcVUW\hi b[ž']b'<YggYb'_ca a h'YXYf'Ui Z gY]bY'?cghYbž'XYf'X]Y'BUhi f``]YVh"

?i `hi fY``Y '9bhXYW_i b[Yb']b'< YggYb

< YggYb ']gh'b]W\ h'bi f'ZØf'gY]bY'VYY]bXfi W_YbXYb
B Uhi f`UbXgW\ UZhYb'VY_Ubbhz'gcbXYfb'V]YhYh'Ui W\ 'Y]bY'J]Y`nU\`
_i `hi fY``Yf'9bhXYW_i b[Yb'ZØf'+bhYfYgg]YfhY"'Jcb'\]ghcf]gW\Yb
GY\Ybgk ØfX][_Y]hYb'V]g'\]b'ni 'a cXYfbYb'A i gYYb'[]Vh'Yg']b
< YggYb'Y]bY'A Yb[Y'ni 'Yf_i bXYb"</pre>

9]b 'UVgc`i hYg'<][\`][\h'ZØf'?i `hi f`]YV\UVYf']gh'XUg'GhÀXY`
A i gYi a ']b': fUb_Zi fh"'A]h'Y]bYf'VYY]bXfi W_YbXYb'GUa a `i b['j cb
ØVYf'&"+\$\$'; Ya À`XYb'Ui g'j YfgWX]YXYbYb'9dcWXYb']gh'XUg'GhÀXY`
A i gYi a 'Y]bYg'XYf'k]WXh][ghYb'?i bgha i gYYb']b'8Yi hgWX`UbX"
<]Yf'_Ubb'a Ub'A Y]ghYfk Yf_Y'j cb'?Øbgh`Yfb'k]Y'FYa VfUbXhž
8ØfYf'i bX'D]WUggc'VYghUi bYb"

: Øf'; YgW\]W\hg]bhYfYgg]YfhY'V]YhYh'g]W\'Y]b'6Ygi W\'XYf'K UfhVi f[]b'9]gYbUW\'Ub"8]Y'6i f[ž'X]Y'ni a 'I B9G7C!K Y`h_i `hi fYfVY [Y\Òfhž'k Uf'Y]bgh'XYf'Cfhž'Ub'XYa 'A Ufh]b'@ h\Yf'X]Y'6]VY` ØVYfgYhnhY'''< Yi hY'_Ubb'a Ub'Ui Z'XYb'Gdi fYb'XYg'VYfØ\a hYb FYZcfa Uhcfg'k UbXY`b'i bX'X]Y'dfUW\hj c``Yb'FÀi a Y'XYf'6i f[VYg]W\h][Yb"

9]b'k Y]hYfYg'_i `hi fY``Yg'<][\`][\hi]b'< YggYb']gh'XUg
A Uh\Ya Uh]_i a ']b';]Y» Yb"'5`g'YfghYg'a Uh\Ya Uh]gW\Yg
A]ha UW\a i gYi a 'XYf'K Y`h'V]YhYh'XUg'A Uh\Ya Uh]_i a ']bhYfU_h]j Y
5i gghY``i b[Ybž']b'XYbYb'6Ygi W\Yf'a Uh\Ya Uh]gW\Y'D\Abca YbY
gY`Vgh'Yf`YVYb'_ObbYb"'Jcb'[Yca Yhf]gW\Yb': cfa Yb'V]g'\]b'ni
cdh]gW\Yb'=`i g]cbYb'[]Vh'Yg'\]Yf'j]Y``ni 'YbhXYW_Yb"

K Yf'g]W\'ZØf'a cXYfbY'?i bgh']bhYfYgg]Yfhž'gc``hY'Y]bYb'6Ygi W\']a AigYia 'K]YgVUXYb'Y]bd`UbYb"'8Ug'AigYia 'VY\YfVYf[h'Y]bY ia ZUb[fY]W\Y'GUaa`ib['jcb'; YaÀ`XYbž'G_i`dhifYb'ibX

; $fUZ]_Yb^*Uig^*XYa^*%-"^V]g^*&%"^*JVfVibXYfh"^6YgcbXYfg^*VY_Ubbh^*]ghX]Y^*GUaa^*ib[^*XYg^*9IdfYgg]cb]ghYb^*5^YIY^*jcb^*Jk^Ybg_m"$

 $BYVYb`XYb`[fc*Yb`AigYYb`[]Vh`Yg`]b`<YggYb`UiW\`nU\`fY]W\Y __`Y]bY'; U`Yf]Yb`ibX`?ibgh\UbXk Yf_ggh\AhhYbž`X]Y`Y]bYb`9]bV`]W_`]bX]Y`fY[]cbU`Y`?ibghgnYbY`V]YhYb"`Jcb`hfUX]h]cbY``Yf`AU`YfY]`V]g \]b`ni`nY]h[Yb\Ogg]gW\Yf`:chc[fUZ]Y`[]Vh`Yg`\]Yf`ZØf`^YXYb?ibgh[YgW\aUW_Yhk Ug`ni`YbhXYW_Yb"$

 $\pm g[YgUa h'V]YhYh' < YggYb'Y]bY'j]Y`ZÀ`h][Y'_i `hi fY``Y'GnYbYž'X]Y'Yg ni 'Yf_i bXYb'`c\bh"'9[U``cV'?i bghž'; YgW\]W\hY'cXYf'A Uh\Ya Uh]_']b' < YggYb'[]Vh'Yg'_i `hi fY``Y'9bhXYW_i b[Yb'ZØf''YXYb'; YgW\a UW_"$

5VYbhYiYf`]WXY`IbhYfbY\aib[Yb`ZØf 5XfYbU`]b!ib_]Yg

9]b'UVgc'i hYg'<][\'][\h'ZØf'5XfYbU']b! $\not\Rightarrow$ b_]Yg']gh'XUg'6i b[YY! $\not\Rightarrow$ a d]b['Ua 'Jc[Y`gVYf["'Jcb'Y]bYf']a dcgUbhYb'6fØW_Y'Ui g ghØfnYb'g]W\'K U[Ya i h][Y']b'X]Y'H]YZY'i bX'Yf`YVYb'Y]bYb 5XfYbU`]b_]W_'XYf'VYgcbXYfYb'5fh"8]Y'UhYa VYfUi VYbXY'5i gg]W\h i bX'XYf'ZfY]Y': U```gcf[Yb'ZØf'i bj Yf[Ygg`]W\Y'A ca YbhY'i bX 5XfYbU`]b'di f"

K Y]hYf'[Y\h'Yg'a]h'UWh]cb[Y`UXYbYb'?`YhhYfhcifYb']a 'CXYbk U`X" A i h][Y'?`YhhYfYf'_ÒbbYb'\]Yf']\fY'; fYbnYb'UighYghYb'ibX'UbghY]`Yb': Y`gk ÀbXYb']\f'? ÒbbYb'ibhYf'6Yk Y]g'ghY``Yb"'8]Y < YfUigZcfXYfib['ibX'XYf'BYfjYb_]hnY``aUWXYb'X]YgY'5_h]j]hÀh'niY]bYa'ibjYf[Ygg`]WXYb'5VYbhYiYf'ZØf'5XfYbU`]b!\$\square

 $: \emptyset f : Ubg "j cb "K Ugg Yfg d cfh Ufh Yb "V] Yh Yh "XYf "F \ Y] b "g d Ubb Yb XY \\$

A Ò[`]WX_Y]hYb ZØfK]`Xk UggYf!FUZh]b["'6Y]'fUgUbhYb'5VZU\fhYb Xi fWX'fY]» YbXY'GhfÒa i b[Yb'Yf`YVYb'5XfYbU`]b!\$ b_]Yg'XYb i `h]a Uh]j Yb'?]W_'i bX'_ca a Yb'j c``'Ui Z']\fY'?cghYb"'9]bY Ui ZfY[YbXY'i bX'UWh]cb[Y`UXYbY'5_h]j]hÀh'ZØf'U``Yž'X]Y'XUg 5VYbhYi Yf'`]YVYb"

5V[YfibXYhrk YfXYbrX]YrUVYbhYi Yfr]WXYbrI bhYfbY\a i b[YbrZØf5XfYbUr]b!\$\delta b_]Ygr]br< YggYbrXi fWXrgdY_hU_i rAfYr7Ubmcb]b[! Hci fYbr]arBUhi fdUf_r?YrrYfk UrX!9XYfgYY"r6Y]rUVYbhYi Yfr]WXYbGWXri WXhk UbXYfi b[Ybžr?rYhhYfdUggU[Ybri bXrGdfØb[Ybr]b[rUg_rufYrDccrgrYfrYVYbrA i h][YrY]brY]barUr][YgrCi hXccf!9frYVb]gjcrrYfr5Wh]cbri bXrBYfj Yb_]hnYr"

GWX i ggZc [Yfi b[

8 YhU]`g