

GhUXh`YVYb. K]Y a Ub g]W XUj cb b]W h X]Y GYY`Y YfXfØW_Yb ``Aggh

K À\fYbX'i bgYfFFY]gY'U\f']b'gY]bYb''YhnhYb'A cbUh'[Y\hz n]hhYfb'a Y]bY'BYfj Yb'VY]'XYa ; YXUb_Ybz']bg'GhUXh`YVYb ni fØW_ni _Y\fYb'''A Y]bY'< Y]a UhghUXh']gh'Y]b'[fc»Yfz k Y]h`Ài Z][Yf'8gW\i b[Y`' '5`g'i bgYf'FY]gY'U\f']b'XYb''YhnhYb A cbUh'[Y\hz'n]hhYfb'a Y]bY'BYfj Yb'VY]'XYa ; YXUb_Ybz'bUW\ @cbXcb'ni fØW_ni _Y\fYb'''A Y]bY'< Y]a UhghUXh']gh'Y]b'[fc»Yfz k Y]h`Ài Z][Yf'6YhcbXgW\i b[Y`'a]h'k Yb][Yb'A Ub]YfYb'''6]hhYb G]Y'a]W\z'Y]b'GnYbUf]c'ni 'VYgW\fY]VYbz'XUg'VY]gd]Y`gk Y]gY ZØf'GUa cU'hmd]gW\']ghz'i bX']W\' k ØfXY'\Langle bYb'Yfn\A\'Ybz'k]Y GUa cUbYf'gh\AbX]['X]Y'G]hnY'hUi gW\Yb'i bX'g]W\']b'6i ggYb bYi 'UbcfXbYbz'i a 'g]W\Yfni ghY``Ybz'XUgg'gc'j]Y`Y'A YbgW\Yb k]Y'a \O[`]W\'Y]bYb'G]hnd`Uhn'\UVYbz'i bX'bcfa U`Yfk Y]gY gc[Uf']\fY'Y][YbYb'Fi bXYb'UbV]YhYb'/ Ua d\XY``]d/

K À\fYbX'i bgYf'FY]gY'U\f']b'gY]bYb'`YhnhYb'AcbUh'[Y\hž'n]hhYfbaY]bY'BYfjYb'VY]'XYa'; YXUb_Ybž']bg'GhUXh`YVYbnifØW_ni_Y\fYb"'AY]bY'<Y]aUhghUXh']gh'Y]b'[fc»Yfž'kY]h`ÀiZ][Yf8gWXib[Y`

5`g'i bgYf'FY]gY'U\f']b'XYb'`YhnhYb'AcbUh'[Y\hž'n]hhYfb'aY]bY BYfjYb'VY]'XYa'; YXUb_Ybž'bUW\'@cbXcb'nifØW_ni_Y\fYb"AY]bY <Y]aUhghUXh']gh'Y]b'[fc»Yfž'kY]h`ÀiZ][Yf'6YhcbXgW\ib[Y`'a]h kYb][Yb'AUb]YfYb"

6]hhYb'G]Y'a]W\ž'Y]b'GnYbUf]c'ni 'VYgW\fY]VYbž'XUg'VY]gd]Y`gk Y]gY ZØf'GUa cU'hmd]gW\']ghži bX']W\'k ØfXY'\phony bYb'Yfn\hank\`Ybž'k]Y GUa cUbYf'gh\hank\]['X]Y'G]hnY'hUi gW\Yb'i bX'g]W\']b'6i ggYb'bYi UbcfXbYbži a 'g]W\Yfni ghY``Ybž'XUgg'gc'j]Y`Y'\hank\]Y a Ò[`]W\'Y]bYb'G]hnd`Uhn'\UVYbži bX'bcfa U`Yfk Y]gY'gc[Uf']\fY Y][YbYb'Fi bXYb'UbV]YhYb'fg]Y\Y'Bf"'('jcb')'\ØVYffUgW\YbXY : U_hYb'\ØVYf'GUa cUŁ"

GhY``Yb`G]Y`a]f`Y]bY`À\b`]W\Y`: fU[Y`ni `@cbXcbži bX`]W\`k ØfXY
\bYb`k U\fgW\Y]b`]W\'j cb`XYf`NY]h`YfnÀ\`Ybž`U`g`]W\`VYcVUW\hYhYž
k]Y`Y]b`A Ubb`Ub`XYf`I !6U\bghUh]cb`C I ZcfX`7]fW' g`X]Y`HfYddY
\]bi bhYfghc`dYfhY"'9f`ghØfnhY`bUW\'j cfbY`i bX``UbXYhY`_cdZØVYfž
XYb`?cdZ'Ui Z`XYa `6cXYbž`X]Y`6Y]bY`]a a Yf`bcW\'ØVYf`XYf`HfYddY
[YgdfY]nh"'9f`\UhhY`[`Ug][Y`5i [Yb`i bX`\UhhY`XUVY]`Y]bYb`GW\i\
j Yf`cfYb"

5``Y'i a 'a]W\'\Yfi a 'YfghUffhYb'ZØf'Y]bY'GY_i bXYž'j Yfgi W\hYb'ni YbhgW\Y]XYbž'cV'Yf'hc``dUhgW\]['cXYf'VYhfi b_Yb'k Ufž'i bX'ZfU[hYbg]W\ž'cV'g]Y']\a '\Y`ZYb'cXYf']\b'][bcf]YfYb'gc``hYb''K]f YbhgW\]YXYb'i bg'U``Y'ZØf'@YhnhYfYg'i bX'gi W\hYb'i bg'j cfg]W\h][Y]bYb'K Y['i a ']\b'\Yfi a "

5`gʻ]WX`j cfVY][]b[ž\ÒfhY`]WX`]\b` 9bhgWXi`X][i b[`gU[YbžʻgY]bY Gh]a a Y`_`Ufʻi bX`j Yf`Y[Yb"'+b`X]YgYa `A ca Ybh`\UgghY`]WX`a]WX XUZØfž`XUgg`]WX`b]WXh'j Yfgi WXh`\UhhYž`]\a `ni `\Y`ZYb`cXYf`]\b`ni VYfi\][Yb"; fc»ghÀXhY`VYhÀi VYb`X]WX`ZØf`UbXYfY`A YbgWXYb.`]\fY DfcV`Ya Yž`]\fY`GWXa YfnYbž`]\fY`V`c»Y`5bk YgYb\Y]h"

J]Y``Y]Wkhi]ghiYgʻU`gʻ, VYf`YVYbghU_h]_ʻbchk YbX]["'J]Y``Y]Wkhi]ghiYg Y]bZUWkib]Wkhia Ò[`]Wkžig]Wkii a 'UWkhiA]``]cbYbiA YbgWkYbini _Øa a Yfbžik YbbiG]Y`U``Y`]biY]bYfiYfgh]W_YbXYbiGhUXhii a 'D`Uhn f]b[YbžiUVYfiYgi[]Vhi_`Y]bYi8]b[YžiX]Yik]fihi bi_ÒbbYbžii a ii bg i bXii bgYfYbiA]ha YbgWkYbiXUgi@YVYbini 'Yf`Y]WkhYfb"

%" < Òf Ui Zž i a 'NY]hZfU[a YbhY ni '_Àa dZYb

±0 a]f VfcXY`h'Y]bY VYgcbXYfY'K i hžk Ybb']W\`\]bhYf'Ya UbXYa ghY\Yž'XYf'X]Y'Fi g\'< ci f'k]Y'Y]bYb'GcbbhU[ggdUn]Yf[Ub[VY\UbXY`h' i bX'XUg'a]hhYb']a 'HfYddYb\Ui g"'A UbW\a U`'V]b']W\ k ØhYbXž'k Y]`']W\'Xcfh'Ub_ca a Yb'a i ggž'k c']W\'\]b'k]``"'5bXYfY A U`Y']gh'Yg'Y]bZUW\'Ui g'; Yk c\b\Y]h"

B UhØf`]W\ 'Vf]b[h'i bg'XUg'< Yfi a fUgYb'bi f'k]bn][Y'6fi W\ghØW_Y Ub'NY]h 'GY_i bXYbž'j]Y``Y]W\h'A]bi hYbž'k Ybb'k]f'; `ØW_'\UVYb" 8 Yb_Yb'G]Y'Ub'U``X]Y'NY]hž'X]Y'G]Y']b'`Ub[k Y]`][Yb

6YgdfYWXi b[Yb'cXYf'j cf'XYa : YfbgY\Yf'cXYf'Ui Z': UWVVcc_'cXYf Hk]hhYf'j YfVf]b[Yb"'B]Ya UbX'a U['`Ub[Y'5fVY]hgk Y[Yž'UVYf'k]Y k ÀfY 'Ygž'k Ybb'G]Y 'ZØbZ'A]bi hYb': UWVVcc_'Ui Z[YVYbž'UbghUhh'X]Y @Yi hY'b]YXYfni a À\Ybž'i a 'Yhk Ug'NY]h'ni fØW_ni [Yk]bbYb3

&"'GY]Yb'G]Y'g]W\'XYg': fY]fUi a g'UbXYfYf VYk i ggh

 $8 \ Ug'VYXYi \ hYh'6Y]bY'i \ bX'9``Vc[Yb']b'XYb'; \ fYbnYb' \Rightarrow fYg'G]hnYg'' \\ 8 \ Ug'VYXYi \ hYhž'XUgg'G]Y'Ya \ UbXYa' \Rightarrow fY'NY]hi \ b[\ \check{z}' \Rightarrow f'HY`YZcb'cXYf \\ \Rightarrow fYb'?]bX`Y'b]Wh'X]fY_h']bg'; Yg]Wh'gWX]YVYb''$

 $9g`VYXYi hYhž`g]WX `b]WX h`Ui Z`Y]bY`GhUb[Y`ni `ghØhnYbž`Ub`XYf`g]WX A YbgWX Yb`ZYgh\U`hYb`_ObbYb"`9g`VYXYi hYhž`XYb`J cfXYfa Ubb VY]a `9]bghY][Yb`]b`Y]bYb`Ni [`b]WX h`ni `gWXi VgYb` `cXYf Y]bni ghY][Ybž`VYj cf`U``Y`Ui g[Ygh]Y[Yb`g]bX"`9g`VYXYi hYhž`XYb j YfXUa a hYb`; Ub[`\]bi bhYfni [Y\Yb"`9g`VYXYi hYhž`\fYb`A Ø``Ui Zni \YVYb"`9g`VYXYi hYhž`UbXYfYb`A YbgWXYb`_Y]bYb _fYVgYffY[YbXYb`FUi WX`]bg`; Yg]WX h`ni `V`UgYb"`9g`VYXYi hYhž b]WXh`]b`\\\fYb`GXYf`\\\\fYA i g]_`ni ``Ui h`ni gd]Y`Yb"`9g`VYXYi hYhž`b]WXh`]b`X]Y`K UfhYgWX`Ub[Y`ni `gdf]b[Yb"$

9g'VYXYi hYhž'g]WX'VYk i ggh'ni 'gY]bž'XUgg'A YbgWXYb'i a 'Y]bYb \Yfi a 'g]bX"

' "'GWX Yb_Yb'G]Y'=\fYa '6Uf]ghUž NY]hgWX f]ZhYb\ÀbX`Yf'cXYf'=\fYf'? Y``bYf]b =\fY'j c``Y'5i Za Yf_gUa _Y]h

'U`h1 k]Y'a Ub'ZØfg'fY]gYb'gdUfh 2 A Ub]YfYb'g]bX']b'_`Y]bYb GhÀXhYb'i bX'8 ÒfZYfb'GhUbXUfX"'K Ufi a ']gh'XUg'GhUXh`YVYb'gc UbXYfg3

8 UgʻGhUXh`YVYbʻ]ghʻgY\fʻ[YgWXÀZh][ʻibXʻ]WXʻjYfghY\YʻX]Y BchkYbX][_Y]hʻjcbʻAi`h]hUg_]b[žʻUVYfʻHY`YZcb[YgdfÀWXYʻgc``hYbk]f_`]WX`[YZØ\fh`kYfXYbž`VYjcfʻG]YʻUbʻX]YʻGd]hnYʻY]bYf KUfhYgWX`Ub[Y`[Y`Ub[Yb"`KYbbʻG]Y`a]hʻYaUbXYaʻqdfYWXYbž`XYf $G]Y `VYX]Y bhž` \ UVYb `G]Y `XYb `5bghUbXž` = f`HY`Y Zcb`k Y[ni `Y[Yb"GWVUi `]\bYb`]b `X]Y `5i [Yb`i bX`fYXY`a]h`]\bYb"$

("8Ub_YgU[Yb

9g'k Uf'DYhYfž'XYf'a]f'U`g'YfghYf'X]Y'5i [Yb'XUZØf'ÒZZbYhYž'k]Y i b\ÒZ]W\'@cbXcbYf'gY]b'_ObbYb'''9f'_ca a h'Ui g'Y]bYf'?`Y]bghUXhž k c'g]W\'X]Y'@Yi hY'VYXUb_Ybž'k Ybb'a Ub'Ub\À`hž'i a 'g]Y']b'Y]bYa Gi dYfa Uf_h[Ub['jcfVY]ni `UggYb'cXYf']\bYb'Y]bY'HØf'Ui Zni \U`hYb'k Ug'bUhØf`]W\'VYXYi hYhž'XUgg']\b'; fc>ghÀXhY']b'XYb'K U\bg]bb hfY]VYb'''5`g'[YVØfh][Yf'@cbXcbYf']gh'a]f'X]YgYg'JYf\U`hYb'[Ufb]W\h'Ui Z[YZU``Ybž'V]g']W\'Ui gXfØW_`]W\'XUfUi Z'\]b[Yk]YgYb k i fXY'''I bX''Yhnh'a Yf_Y']W\'Yg'ghÀbX]['''9]b'8Ub_YgW\`Ob'_cghYhb]W\'hgž'U`gc'V]YhY'XUg'bÀW\ghY'A U`ž'k Ybb'X]f'Ya UbX'Y]bY; YZÀ``][_Y]h'Yfk Y]ghž'Y]bY'ni fØW_''

) "'BY\a Yb'G]Y'Y]bYb': `mYf

?ca a 'gW\cbž'k]f'U``Y'k]ggYbž'XUgg'XUg'J YfhY]`Yb'j cb': `mYfb']b
XYf'Y]g][Yb'? À`hY'Y]b'gYY`YbnYfghÒfYbXYg'I bhYfZUb[Yb'gY]b'a i gg"
B]a a 'Y]bZUW\ž'k Ug'X]f'[YVchYb'k]fXž'`ÀW\`Y'i bX'VYXUb_Y'X]W\"
BY\a Yb'G]Y'Yg'i bX'`YgYb'G]Y'Ygž'cXYf'bY\a Yb'G]Y'Yg'i bX
fYWmWY`b'G]Y'Ygž'cXYf'bY\a Yb'G]Y'Yg'i bX'k YfZYb'G]Y'Yg'k Y["
A UW\Yb'G]Y'Ya UbXYa 'Ub'X]YgYa 'HU['Y]bZUW\'XUg'@YVYb'Y]b
k Yb]['`Y]W\hYf"

*"' $HfU[YbG]Y']aaYf'?cdZ\OfYf$

+"'A UWX Yb'G]Y'_Y]bY'J Yfa i hi b[Yb'ØVYf A YbgWX Yb

?Ybbgh'Xi 'XUg'A ÀXWXYb'a]h'XYa '?cdZlUb!: i »!<]'UV3'G]Y\gh'Xi X]Y'@ci Vci h]bg'i bhYf']\fYa 'Zcfa `cgYb'gWk UfnYb'I a \Ub['cXYf XUg'D]YfW]b[']b']\fYf'`]b_Yb'6fi ghk UfnY3'K Ug']gh'a]h'XYa 'HmdYb a]h'XYf'?fUk UhhY3'A i gg'Y]b'GhUXhk]WXgYf'gY]bž'cXYf3

Bi bžY][Ybh`]W\ k UfYf'VY]a 'DYUWY'7cfdg'i bX'UfVY]hYh'U``Y'nk Y]

K cW\Yb']b'Y]bYa 'CVXUW\`cgYb\Y]a 'Yf\Uh'g]W\'[YfUXY'ZØf'Y]bY

6YYfX][i b['\YfUi g[Ydi hnh"; fc» Y'Gh\AXhY'g]bX'j c``Yf'5fW\YhmdYb\Z\UVYf'XUg'VYXYi hYh'b]W\h\Z\XUgg'A YbgW\Yb'Zcfa `cgY'?`YW_gY'a]h

j cfVYgh]a a hYb'9][YbgW\UZhYb'g]bX"'\\\W\\\UVY'\'hY]`g'Xi fW\\

ØVYffUgW\YbXY'9fZU\fi b[Yb\Z'hY]`g'Xi fW\\\\UfhY'\@Y_h]cbYb'

[Y`Yfbh\Z'A YbgW\Yb'b]W\h'k Y[Yb']\fYg'5i ggY\Ybg'cXYf']\fYg

BUa Ybg'UVni ghYa dY`b"

 $\begin{tabular}{ll} K & $[f'U``Y'\AhhYb'Y]b'VYggYfYg'; YZ\emptyset\``ZØf'X]Y'A YbgWXYb'i a 'i bg \begin{tabular}{ll} Vfi a ž'k Ybb'k & $[f'g]Y'U`g'\DX'b] & $[X'b]WXh'U`g \begin{tabular}{ll} FYdfAgYbhUh]cbYb'gY\Yb'k & $[XYb''] & $[XYb'']$

, "'Ni a 'GWX`i gg' 'k Ybb''Ya UbX'i a ZÀ``hž ZfU[Yb'G]Yž'cV'Yg']\a '[ih'[Y\h

 $9 fbgh\ UZh" \ 9g"]gh'Y]bZUW\& \ 'b]W\& h'U_nYdhUVY`ž'Ya\ UbXYb'ni \\ \emptyset VYfghY][Yb'i bX'gY]bYb'ZfÒ\`]W\& Yb'K Y['ni' [Y\Yb''K Ybb'Ya UbX ghØfnh'cXYf'[Ubn'cZZYbg]W&h`]W&'<]`ZY'VfUi W&hž'V]YhYb'G]Y']\a' <math>\Rightarrow$ fY <]`ZY'Ub" \ 8 Yf'6mghUbXYf! \ 9ZZY_h'`Y[h'bU\Yž'XUgg'Y'a Y\f'A YbgW&Yb]b'Y]bYf'G]hi Uh]cb'Ubk YgYbX'g]bXž'XYghc'k Yb][Yf'k U\fgW&Y]b`]W&]gh'Ygž'XUgg'g]Y'\Y`ZYbž'k Y]`'g]Y'XUj cb'Ui g[Y\Ybž'XUgg'Ya UbX UbXYfYg'Yg'hi b'k]fX"'GY]'X]YgY'DYfgcb"

 $J Y fm'6f]h]g \land Dfc V `Yag' j cb' Fc V' HYad`Y']gh'Y]b'if_ca]gWX Yf 9]b V `]W_']b' X]Y' V f]h]gWX Y' DgmWX Y ž' X Y f'n Y][hž'k]Y' k]f'Y]b Y' B Uh]cb$

j cb 'gcn]U`'i bVY\c`ZYbYbž'UVYf'k c\`a Y]bYbXYb 'Gd]bbYfb 'g]bXž X]Y 'YXYb 'HU['XUfi a '_Àa dZYbž'Yg'ni 'ØVYfghY\Ybž'c\bY'g]W\'VY] Y]bYa '`YV`cgYb'CVY_h'ni 'YbhgW\i 'X][Yb"

@Y]hV]`X.`8fYUa gh]a Y

·

8 Y hU]`g

6Ygi WXYb G]Y i bg Ui Z Y]bY!fY]gY "XY