

6Yf`]bg'j YfVcf[YbY'GWXÀhnY.'9bhXYW_Yb G]Y'X]Y'GhUXh'k]Y'b]Y'ni j cf°

 $9bhXYW_Yb^*G]Y^*X]Y^*ZUgn]b]YfYbXYb^*GY^Ybgk @fX][_Y]hYb\\6Yf^]bg.~i~cb^*\]ghcf]gWXYb^*GhAhhYb^*ØVYf^_i~hi~fY^*Y^<][^*][^hgV]g^*ni~i~fYfghYW_hYb^*GWXAhnYb^**=XYU^*Z@f^*FY]gYbXY^*$



6Yf`]bžX]Y`di`g]YfYbXY`< Ui dhghUXh`8Yi hgW\`UbXgž]gh`Y]b`Cfhž`UbXYa ; YgW\]W\hY`i bX`A cXYfbY`Ui ZY]bn][Ufh][Y`K Y]gY j YfgW\a Y`nYb"`8]YgY`GhUXhžX]Y`Y]bgh`Xi fW\`X]Y`6Yf`]bYf`A Ui Yf [YhY]`h`k Ufž`\Uh`g]W\`ni `Y]bYa '_i `hi fY``Yb`NYbhfi a '9i fcdUg Ybhk]\w_Y`hž`XUg`6Ygi W\Yf`Ui g`U``Yf`K Y`h`Ubn]Y\h"`Jcb VYY]bXfi \w_YbXYb`\]ghcf]gW\Yb`Gh\hhYb`V]g`\]b`ni Uj Ubh[UfX]gh]gW\Yb`?i bghgnYbYb`V]YhYh`6Yf`]b`Y]bY`J]Y`ZU`hž`X]Y _Ui a 'Y]bY`UbXYfY`A Yhfcdc`Y`YffY]W\Yb`_Ubb"`CV`G]Y`Xi fW\`X]Y GhfU\"Yb`gW\`YbXYfbž'X]Y`Gdi fYb`XYf'JYf[Ub[Yb\Y]h`Yf_i bXYb cXYf`XUg``YVYbX][Y`BUW\h`YVYb`[Yb]Y\"Yb'a OW\hYb``6Yf`]b`\Uh Z\Of`YXYb`; YgW\a U\w_Yhk Ug`ni `V]YhYb"`8]Y`GhUXh`]gh`Y]b `YVYbX][Yg'; YgW\]W\hgVi W\žXUg`ni [`Y]W\`Y]bYb`6`]\w_`]b`X]Y

Ni _i bZh`k U[h"'@UggYb`G]Y`g]W\`j cb`XYf`9bYf[]Y`i bX`XYa `7\Ufa Y X]YgYf`A Yhfcdc`Y`j YfnUi VYfb`i bX`YbhXYW_Yb`G]Yž`k Ufi a `6Yf`]b Y]b`i bj Yfn]W\hVUfYg`FY]gYn]Y``]gh"

< Ui dhUhhfU_h]cbYb 6Yf`]bg



6Yf`]bž'X]Y`< Ui dhghUXh'8Yi hgWX`UbXgž']gh'Y]b'GWXa Y`nh]Y[Y``Ui g
; YgWX]WXhYž'?i `hi f'i bX'A cXYfbY''8]Y'GhUXh'V]YhYh'Y]bY

VYY]bXfi W_YbXY'J]Y`ZU`h'Ub'GY\Ybgk ØfX][_Y]hYbž'X]Y'gck c\`
\]ghcf]gWX'\(\div \mathred{h} \mathred{h} \mathred{f} \mathred{f} \mathred{g} \mathred{f} \mathred{f} \mathred{g} \ma

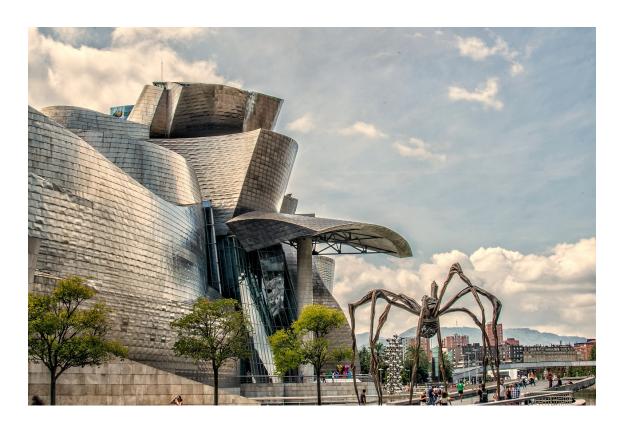
8 Ugʻ6fUbXYbVi f[YfʻHcfʻ]ghʻnk Y]ZY``cgʻY]bYgʻXYfʻVY_UbbhYghYbGma Vc`Yʻ6Yf`]bgʻi bXʻY]bʻUVgc`i hYgʻA i ggʻZØfʻYXYbʻ6Ygi WkYf"8]YgYgʻbYc_`Ugg]n]gh]gWkYʻA cbi a YbhʻUi gʻXYaʻ%, "ʻ¾J\f\i bXYfhVYZ]bXYhʻg]Wkʻ]aʻk Ygh`]WkYbʻHY]``XYgʻGhUXhnYbhfi a gžʻUbʻXYf?fYi ni b[ʻj cbʻl bhYfʻXYbʻ@]bXYbʻi bXʻ9VYfhghfU»YžʻX]fY_hʻUi ZʻXYf

DUf]gYf'D`Uhn"'9fVUi h'nk]gWXYb'%+, , 'i bX'%+-%'i bhYf'? Òb][: f[YXf]WX K]`Y`a = "i cb DfYi » Yb i b X Ybhk cfZYb i ca5fWX]hY_hYb'7Uf`; chh\UfX'@Ub[\Ubgž]gh'XUg'Hcf'jcb'XYb $DfcdmAYbXYf5_fcdc]q]b5hYb]bqd]f]Yfh"A]hY]bYf<OYY]cb$ & * A YhYfb i b X Y]b Y f '6 f Y]h Y i c b · *) 'A Yh Y f b · V Y Y]b X f i W_h Y g · X i f W nk Ò`Z'Xcf]qWXY'GÀi `Yb'i bX'ZØbZ': i » [Àb[Yfni [Àb[Y"'?fÒbYbX h\fcbh'XUfUi Z'X]Y'Ei UXf][Už'Y]b'j cb' ≈\Ubb'; chhZf]YX'GW\UXck [YgWXUZZYbYf'K U[Yb'a]h'j]Yf'DZYfXYbž'XYf'jcb'XYf':f]YXYbg[Òhh]b $fYbY'[Y'Yb_h'k]fX''' < ghcfgW [YgY\Yb'k Uf'XUg'Hcfž'i fgdfØb[']W$ U`g`:f]YXYbghcf 'VY Ubbhž'GW\Uid`Uhn'VYXYihYbXYf'9fY][b]ggY i bX'Y]b'Gma Vc`'XYf'HY]`i b['k À\fYbX'XYg'?U`hYb'?f]Y[Ygž'XU'Yg X]fY_h'Ub'XYf'6Yf`]bYf'AUi Yf'ghUbX"'BUWX'XYf'K]YXYfj YfY]b][ib[%--\$'kifXY'Yg'nia'NY]W\Yb'jcb'9]b\Y]h'ibX':fY]\Y]h''<YihY']gh $YgY]b'nYbhfUYf'Cfh'ZØf'_i `hi fY``Y'JYfUbghU`hi b[Yb'k]Y'X]Y': Y]Yf$ ni a '&\$"'\\fYghU['XYg'A Ui YfZU``g'cXYf'X]Y'G]Y[YgZY]Yf'XYf $XYi hgWXYb: i \gg VU``bUh]cbU`a UbbgWXUZh'VY]'XYf: = 5!$ K Y`ha Y]ghYfgW\UZh`&\$%("": Øf'k Y]hYfY'8YhU]`g'ni f'; YgW\]W\hY'i bX 6YXYi hi b['XYg'HcfYg'`c\bh'g]W\ 'Y]b'6`]W_'Ui Z'X]Y'Ui gZØ\f`]W\Y 8c_i a YbhUh]cb VY] K]_]dYX]U" 8Ug 6fUbXYbVi f[Yf Hcf]gh [Ubn'À\f]['ni [Àb[`]W\ ž'ZØf'XYb'J Yf_Y\f'[YgdYffh'i bX'HY]`'Y]bYf :i»[Àb[YfncbYžk Ug'Yg'ni 'Y]bYa 'VY`]YVhYb 'HfYZZdib_h'ZØf 9]b\Y]a]gW\Y'i bX'Hci f]ghYb'a UW\hž']bgVYgcbXYfY'ni 'G]'j YghYf cXYf'VY]']bhYfbUh]cbU`Yb'GdcfhYj Ybhg"

XYf'B Uh]c b U`gcn]U`]ghYb 'VY[Øbgh][hYž'i b X']gh'\Yi hY 'Y]b 'C fhž'XYf X]Y 'K YfhY 'XYf'8 Ya c_fUh]Y i b X'XYg'K]YXYfUi ZVUi g'j Yf_ÒfdYfh" 9]b 'GdUn]Yf[Ub['Xi fWX 'XUg'; YVÀi XY'i b X'X]Y'?i ddY`'j Yfa]hhY`h Y]b 'h]Y ZYg'J YfghÀb Xb]g' ZØf'X]Y 'dc`]h]gWXY'; YgWX]WX hY '8 Yi hgWX`Ub Xg i b X'X]Y'6YXYi hi b['6Yf`]b g'U`q' < Ui dhghUXh"

 $8Yf'6Yf']bYf'8ca~z'Y]b'k~Y]hYfYg'K~U\fnY]W\Yb'XYf'GhUXhz'Yf\YVh$ g]WX a UYghÀh]gWX Ui Z'XYf'A i gYi a g]bgY``]a '< YfnYb'6Yf`]bg"'8]YgY $VYY]bXfiW_YbXY^?UhVXfUYZ^X]Y^nk]gWXYb^%, -('ibX^%-$)^]a^Gh]$ XYfBYcfYbU]qqUbW'ibXXYqBYcVUfcW_YfVUihkifXYž]qhb]W\h bi f'Y]b'Cfh'XYg'; `Ui VYbgž'gcbXYfb'Ui W\'Y]b'UfW\]hY_hcb]gW\Yg i k Y`"A]h'gY]bYf']a dcgUbhYb'?i ddY`ž'X]Y'Ub'XYb'DYhYfgXca']b Fca 'Yf]bbYfhž'i bX'XYb'_i bghj c``Yb'JYfn]Yfi b[Yb'n]Y\h'XYf'8ca 'À\f`]WX '<i bXYfhhUi gYbXY '6Ygi WXYf'Ub" =a '=bbYfYb'VYY]bXfi W_Yb X[Y] dfÀW\h][Yb'AcqU] YžX[Y] < c\Ybnc``Yfb!; fi Zh'i bX'X[Y]a ÀWX h][Y'GUi Yf!Cf[Y`"'6Ygi WXYf'_ÒbbYb'ni XYa 'X]Y'?i ddY` VYghY][Yb'i bX'Y]bYb'ZUbhUgh]gW\Yb'6`]W_'Ui Z'X]Y'i a `]Y[YbXY GhUXh'[Yb]Y»YbžY]bqWX`]Y»`]WX'XYf'GdfYY'i bX'XYf'VYbUWXVUfhYb $A i gYYb"8Yf6Yf]bYf8ca \underline{UhY}bYkYWkgYjc``Y; YgWk]WkhY$ i bX'Yfgh']b'XYb'%--\$Yf!\J\fYb'jc``gh\bX]['fYghUif]Yfh''<YihY']gh Yf'Y]b'Gma Vc`'ZØf'X]Y'_i `hi fY``Y'i bX'gd]f]hi Y``Y'6YXYi hi b['6Yf`]bg i b X 'Y]b 'V Y `]Y V hY f 'C fh 'ZØf'? c b n Y fh Y i b X '; c hh Y g X]Y b g h Y " '8]Y '@U[Y Ui Z'XYf'A i gYi a g]bgY``a UW\h']\b'ni XYa 'ni a ']XYU`Yb $5ig[Ub[gdib_h^*ZØf^*Y]bY^*9f_ibXib[^*XYf^*kY^*hVYfØ\a hYb^*AigYYb]$ 6Yf`]bg"

?i `hi fY``Y '<][\ `][\ hg



6Yf`]b`]gh'b]W\h'bi f'Y]bY'GhUXh'XYf'; YgW\]W\hY'i bX'Dc`]h]_ž
gcbXYfb'Ui W\Y]b'NYbhfi a 'ZØf'?i bghi bX'?i `hi f"'8]Y'< Ui dhghUXh
8Yi hgW\`UbXg'VY\YfVYf[h'Y]b][Y'XYf'VYXYi hYbXghYb'A i gYYb'i bX
; U`Yf]Yb'XYf'K Y`hž'X]Y'gck c\``\]ghcf]gW\Y'GW\AhnY'U`g'Ui W\
nY]h[YbÒgg]gW\Y'K Yf_Y'dfAgYbh]YfYb"'Ni 'XYb'\YfUi gfU[YbXghYb
CfhYb'[Y\ÒfYb'X]Y'A i gYi a g]bgY`ž'Y]b'Y]bn][Ufh][Yg'9bgYa V`Y
j cb'K Y`h_`UggY!A i gYYbž'i bX'X]Y'9Ugh'G]XY'; U``Yfmž'Y]b
VYY]bXfi W_YbXYg': fY]`i Zh_i bghk Yf_ž'XUg'X]Y'6Yf`]bYf'A Ui Yf']b'Y]b
Gma Vc``XYf': fY]\Y]h'j Yfk UbXY`h'\Uh"'8]YgY'GhAhhYb'V]YhYb'b]W\h
bi f`Agh\Yh]gW\Yb'; Ybi ggž'gcbXYfb'YfnA\`Yb'Ui W\X]Y
; YgW\]W\hYb'j cb'6Yf`]bg'J Yf[Ub[Yb\Y]h'i bX'; Y[Ybk Ufh"

8]Y'AigYiag]bgY`ž'[Y`Y[Yb'UiZ'XYf'GdfYY]bgY``]a'<YfnYb'6Yf`]bgž]gh'Y]b'_i`hifY``Yg'<][\`][\hž'XUg'gY]h'%---inia'IB9G7C!
KY`h_i`hifYfVY'[Y\Ofh"8]YgYg'Y]bn][Ufh][Y'9bgYaV`Y'iaZUgghZØbZ'kY`hVYfØ\ahY'AigYYb.'XUg'5`hY'AigYiaž'XUg'BYiY
AigYiaž'X]Y'5`hY'BUh]cbU`[U`Yf]Yž'XUg'6cXY!AigYia'ibX'XUg
DYf[UacbaigYia"'9bhk]W_Y`h'nk]gW\Yb'%' \$'ibX'%-'\$'ibhYf

XYb dfYi »]gWX Yb ? Ob][Yb i bX [YghU`hYh'j cb ZØbZ'j YfgWX]YXYbYb 5fW\]hY_hYbžkifXY`X]Y`\pqY``%, (%'jcb'?\)b][':f]YXf]W\`K]`\Y`a ⇒J"XYf"?ibghibXK]ggYbgWkUZh [Yk]Xa Yh":>XXYg`AigYia VY\YfVYf[h'Y]bn][Ufh][Y'GUa a `i b[Ybž'X]Y'Y]bYb'k Y]hYb'6c[Yb Xi fW X]Y; YgW]W hY XYf A YbgW \Y]h qdUbbYb "Gc nY][h XUq DYf[UacbaigYia'VYY]bXfiW_YbXY'Ubh]_Y'5fW\]hY_hifž'k À\fYbX XUqBYiYAigYia UfWXAc`c[]qWXYCVY_hY`gck]Y`A[mdh]qWXY`ibX Yhfi $g_{g}WYG_{i} dhi fYb dfÀgYbh]YfhžXUfi bhYfX]Y k Y`hVYfØ\a hY$ BcZfYhYhY"8Ug'5`hY'AigYia'k]XaYh'g]WX'XYf'[f]YWX]gWXYb'ibX fÒa]gWXYb ?i bghž XUg 6cXY!A i gYi a 'nY][h; Ya À XY j ca 'gdÀhYb Ui Z'?i bgh'XYg'%- "'*\\f\i bXYfhg"'K À\fYbX'XYg'?U`hYb'?f]Y[Yg kifXYb'X]Y'dfYi»]gW\Yb'GUaa`ib[Yb'[YhfYbbhž'XcW\'bUW\'XYf K |YXYf| YfY|b|[i b['_cbbhYb'q]Y'k |YXYf'ni gUa a Yb[YZØ\fh k YfXYb"'GY]h'&\$%- 'Yf[Àbnh'X]Y 'Ja Yg'G]a cb'; U``Yfm'U`g'bYi Yg 6Yqi WXYfnYbhfi a ž'Ybhk cfZYb'j cb'8Uj]X'7\]ddYfZ]Y`Xž'XUq 9f`YVb]g":Ni_ØbZh]['k]fX:X]Y:5fW\Ac`c[]gW\Y:Dfca YbUXY:j]Yf:XYf $Z\emptysetbZAigYYbXifWXibhYf]fX]gWXYYUYf]YbYjYfV]bXYb": ØfY]bYb$ $h]YZYfYb 9]bV]W_]b X]Y; YgWX]WXhYi bX6YXYi hi b[XYf$ A i gYi a g]bgY```c\bh'g]W\'Y]b'6`]W_'Ui Z'X]Y'Ui gZØ\f`]W\Y 8c_i a YbhUh]cb:VY]K]_|dYX]U"8|YAigYia g]bgY`]ghb]Whbif Y]b 'C fh'ZØf'?i bgh`]YV\UVYfž'gcbXYfb 'Ui W\ 'Y]b 'NYi [b]g'XYf $_{\rm i}$ `hi fY``Yb`J]q]cb`6Yf`]bgžXUg`Xi fW\`XYb`bU\Y[Y`Y[YbYb`6Yf`]bYf 8ca i bx xyb @ gh[UfhYb!DUf 'Yf[Abnh k]fx"

9]bYb'[Ubn'UbXYfYbž'UVYf'YVYbgc'ZUgn]b]YfYbXYb'Ni [Ub['ni f?i bgh'V]YhYh'X]Y'9Ugh'G]XY'; U``Yfmž'X]Y'`Àb[ghYni gUa a Yb\Àb[YbXY'GY_h]cb'XYf'6Yf`]bYf'A Ui Yf'a]h'Y]bYf'@Àb[Yjcb'%' %* 'A YhYfb'"G]Y'VYZ]bXYh'g]WX'Ua 'I ZYf'XYf'GdfYY']a GhUXhhY]`': f]YXf]WXg\U]b'i bX'k i fXY'bUWX'XYa ': U``XYf'A Ui Yf'Ua - "'Bcj Ya VYf'%-, - 'j cb'%, '?Øbgh`Yfb'Ui g'&%'@ÀbXYfb'[YghU`hYh'' CZ]n]Y``'U`g': fY]`i Zh[U`Yf]Y'Ua '&, "'GYdhYa VYf'%- - \$'YfÒZZbYhžYf\]Y`h'g]Y'%- - %'XYb'GhUhi g'Y]bYg'[YgWXØhnhYb'8Yb_a U`g'', VYf%\$\; Ya À`XY'_ca a Ybh]YfYb'X]Y'dc`]h]gWXYb'I a k À`ni b[Yb'j cb%-, -#\\$'i bX'a UWXYb'X]Y'; U`Yf]Y'ni 'Y]bYa 'Y]bn][Ufh][Yb'Cfh'XYfFYZYI]cb'ØVYf': fY]\Y]h'i bX'K UbXY`"Ni 'XYb'VY_UbbhYghYb K Yf_Yb'nÀ\`Yb'8a]hf]'Jfi VY`g' 6fØXYf`]WXYf'?i gg ž'XYf'XYb'?i gg nk]qWXYb'@Ycb]X'6fYqWXbYk'i bX'9f]WX'<cbYWYf'XUfqhY``hž'qck]Y

6]f[]h'?]bXYfg' HfUVUbhžXYf'Xi fW\X]Y'A Ui Yf'Vf]W\h "'8U'X]Y ; U`Yf]Y`XYf`K]hhYfi b[`Ui g[YgYhnh`]ghž`g]bX`fY[Y`a À»][Y FYghUi f]Yfi b[gUfVY]hYb'bchk YbX]["'Gc'k i fXYb'V]g'&\$\$\$'' \$\$ A YhYf'XYf'A Ui Yf'fYghUi f]Yfh'i bX'' ' '6]`XYf'bYi '[Ya U`hž'i bX'&\$\$-ZUb X 'Y]b Y 'i a ZUgqYb XY 'F YghUi f]Yfi b['ghUhhž'Ub 'XYf', + '? Øbgh`Yf VYhY]`][h'k UfYb"'GY]h'Bc| Ya VYf'&\$%, ']gh'X]Y'9Ugh'G]XY'; U``Yfm']a 6Yg]hn XYf Gh]Zhi b['6Yf]bYf A Ui Yfž X]Y ZØf]\fY 9f\U hi b[jYfUbhkcfh`]WX:]gh":6YgiWXYf:_ObbYb:X]Y:;U`Yf]Y:fibX:ia::X]Y:I\f $_cghYbcgVYg]Wh][YbžibXYgkYfXYbOZZYbh]WhY: \emptyset\fib[Yb]$ Ub[YVchYbžX]YYhkUY]bYGhibXYXUiYfbibXa]h5iX]c[i]XYq XifW\[YZØ\fh'kYfXYb": Øf'kY]hYfY' ₺ZcfaUh]cbYb'ni : Ø\fib[Yb i b X 'ni f'; YgW W hY 'XYf'; U 'YfY 'Ya dZY\ 'h'gW 'YYb 'GYgi W 'XYf $cZ[n]Y``Yb`GY]hY`VY]'J]g]h`6Yf`]b"`8]Y`9Ugh`G]XY'; U``Yfm`]gh`b]W\h$ bif'Y]b'?ibghk Yf_ž'gcbXYfb'UiW\'Y]b'`YVYbX][Yg'8Yb_a U`ž'XUg $X]Y^{6}YXY^{1}h^{1}b^{-1}XY^{2}AU^{1}Y^{2}U^{2}q^{1}bX^{1}X^{1}Y^{6}Y^{1}bq^{1}W^{1}bUW^{1}fY^{1}Y^{1}h$ Y]bXfi W_gi c```j Yfa]hhY`h"' \ b XYf B À\Y VYZ]bXYb g]WX 'ni XYa X]Y A YfWXYg!6Ybn'5fYbU'i bX'X]Y'C VYfVUi a Vf \emptyset W_Yž'X]Y'a]h']\fYb gma $Vc^{3}gWXYb^{-1}GWXYfY!GhY]b!DUd]Yf^{-1}<AbXYb^{-1}X]Y^{-1}YfV]bXi^{-1}b[^{-1}XYf^{-1}]$ $6Yn]f_Y: f]YXf]WXgVU]b i bX?fYi nVYf['XUfghY``h''$



 $6 Yf`]b `]gh`Y]b Y`GhUXhž`X]Y `j cb `] \setminus fYf`; YgWX]WX hY`[YdfA[h`]ghž`i b X b]f[YbXk c `k]fX`X]Yg`XYi h`]wXYf`U`g`Ub`XYb`\]ghcf]gWXYb`GhA`hhYbž X]Y`Ub`X]Y`VYk Y[hY`J Yf[Ub[Yb\Y]h`8 Yi hgWX`UbXg`Yf]bbYfb''`C fhY k]Y`X]Y`; YXYb_ghA`hhY`6Yf`]bYf`A Ui Yf`i bX`XUg`< c`cWUi gh! A U\ba U``g]bX`b]WX h`bi f`k]WX h][Y`GY\Ybgk ØfX][_Y]hYbž`gcbXYfb Ui WX`Y]bXfi W_gj c``Y`A U\ba U`Yž`X]Y`X]Y`HY]`i b[`XYf`GhUXhž`X]Y GWXfYW_Yb`XYg`B Uh]cbU`gcn]U`]ga i g`i bX`X]Y`6YXYi hi b[`j cb 9f]bbYfi b[g_i `hi f`h\Ya Uh]g]YfYb''`8]YgY`GhA`hhYb`V]YhYb 6Ygi WXYfb`X]Y`A O[`]WX_Y]hž`g]WX`a]h`XYb`Xi b_Y`ghYb`? Ud]hY`b`XYf ; YgWX]WX hY`Ui gY]bUbXYfni gYhnYb`i bX`XYfYb`5i gk]f_i b[Yb`Ui Z X]Y`; Y[Ybk Ufh`ni `fYZY_h]YfYb''$

8]Y; YXYb_ghÀhhY 6Yf`]bYf`A Ui Yf`]b`XYf`6YfbUi Yf`GhfU» Y`]gh`Y]b
nYbhfU`Yf`C fhži a `X]Y; YgW\]W\hY`XYf`HY]`i b[`6Yf`]bg`ni
j YfghY\Yb"8]Y`6Yf`]bYf`A Ui YfžYff]W\hYh`Ua `%' "`5i [i gh`%- * %ž
hfYbbhY`K Yghl6Yf`]b`j cb`C ghl6Yf`]b`i bX`XYf`i a `]Y[YbXYb`88F`V]g
ni `]\fYa `: U```Ua `- "`Bcj Ya VYf`%-, - "`G]Y`k Uf`Y]b`VYk UW\hYg
6Yhcb\]bXYfb]gž`XUgʻa]h`Y]bYf`; YgUa h`Ab[Yj cb`Yhk U`%))
?]`ca YhYfbž`XUfi bhYf`(' ž%?]`ca YhYf`nk]gW\Yb`K Yghl`i bX`Cghl
6Yf`]bž'b]W\h`bi f`d\mg]gW\ž`gcbXYfb`Ui W\`]XYc`c[]gW\`X]Y`GhUXh
hY]`hY"`8]Y`A Ui Yf`gma Vc`]g]YfhY`XYb`9]gYfbYb`J cf\Ub[`XYg`? U`hYb
?f]Y[Yg`i bX`k i fXY'j cb`XYf`88F`U`g` Ubh]ZUgW\]gh]gW\Yf
GW\i hnk U`` `dfcdU[UbX]gh]gW\`[YfYW\hZYfh][hž`i a `X]Y`: `i W\h'j cb

CghXYi hgWXYb]b XYb K YghYb ni j Yf\]b XYfb "J cf]\ fYa 6Ui Zc\Yb'Yhk U'' ž) 'A]``]cbYb'A YbgW\Yb'Ui g'XYf'88Fž'i bX'nk]gW\Yb %- * %'i b X '%- , - 'j Yfgi W hYb 'ØVYf '%\$\$"\$\$\$ž'X]Y 'A Ui Yf'ni ØVYfk]bXYbž'k cVY] 'gW\ Ahni b[gk Y]gY '%' * 'V]g 'ØVYf '&\$\$ 'A YbgW\ Yb XifW.X]Y.88F!; fYbnhfiddYb.[YhÒhYh'kifXYb".8]Y; YXYb ghÀhhY VYk U\fh'Y]bYb'%ž('?]`ca YhYf'`Ub[Yb'5VgW\b]hh'XYf'cf][]bU`Yb A Ui Yf gck]Y 9 Ya YbhY k]Y K UW hØfa Y i bX XYb gc [YbUbbhYb HcXYgghfY]ZYb"'9]b'6Ygi WXYfnYbhfi a 'i bX'Y]b 8c i a YbhUh]cbgnYbhfi a 'V]YhYb 'XYhU]``]YfhY '\DZcfa Uh]cbYb '\OVYf X]Y'; YgWX]WXhY'XYf'AUiYf'ibX'X]Y'GWX]WgU`Y'XYf'CdZYf'': Øf $6YXYIhib[Ya dZ]Y \ hg]WYb 6]W_UIZX]Y UI gZØ f]WXY$ 8c_i a YbhUh]cb VY] K]_ dYX]U" 8]Y ; YXYb_ghÀhhY]gh Y]b Cfh XYg gh]``Yb'; YXYb_Ybqž'XYf'X]Y'HfU[ÒX]Y'XYf'HY]`i b['i bX'X]Y GY\bgi W\h'bUW\: fY]\Y]h'Y]bXfi W gi c```j Yfa]hhY`h"'G]Y'Yf]bbYfh Ui WX 'Ub 'XYb'\]ghcf]gWXYb'A ca Ybh'XYg'A Ui YfZU``g'%-, - ž'XYf'XYb K Y['ni f'XYi hgWXYb'K]YXYfj YfY]b][i b['Ua '' "'C_hcVYf'%- - \$ YVbYhY"

9]bY'kY]hYfY'nYbhfU`Y'GhÀhhY'XYf'9f]bbYfib[']qh'XUq'<c`cWUiqh! A U\ba U`ž'c $\mathbb{Z}[n]Y$ ```U`g' 8Yb_a U`' $\mathbb{Z}\emptyset f$ 'X]Y'Yfa cfXYhYb' \Rightarrow XYb9i fcdUg 'VY_Ubbhž'XUg'g]W\]b XYf'B À\Y XYg'6fUbXYbVi f[Yf'Hcfg VYZ|bXYh" 8 |YqYq VYY|bXfi W YbXY A U\ba U`ž'Ybhk cfZYb'j ca 5fWX]hY hYb DYhYf 9]qYba Ub i bX &\$\$) Y]b[Yk Y]\hz VYqhY\h Ui q &"+%%6 Y hc b ghY `Y b 'i b hY fgW\]Y X `]W\ Y f '< O Y \check{z} X]Y 'Ui Z Y]b Y a k Y``YbZÒfa][Yb': Y`X'Ub[YcfXbYh'g]bX"'9g'Yf]bbYfh'Ub'X]Y'gYW\g A]``]cbYb'≯XYbž'X]Y'k À\fYbX'XYg'BUh]cbU`gcn]U`]ga i g'Yfa cfXYh kifXYbžibX`ghY\h`ZØf`X]Y`ibjcfghY``VUfYb'; fàiY`hUhYb'XYg <c`cWUi ghg"8Yf[YgWX]WXh`]WXY?cbhYlh'XYg'AU\baU`g']gh'h]YZ jYfk i fnY`h`]b'XYf'JYfUbhk cfhi b['8Yi hgW\`UbXgž'X]Y'JYfVfYW\Yb XYfBG!NY]h'Ui Zni UfVY]hYb'i bX'b]Y'ni 'j Yf[YggYb"'8]Y'GhY`Ybž'X]Y Ub 'Y |b '@UVmf|bh\ 'Yf|bbYfbž'gc ``Yb 'VY | '6Ygi W\Yfb 'Y |b '; YZØ\ ``XYf $Cf]Ybh]Yfib[g`cg][_Y]h'ibX'6Y_`Yaaib[``\YfjcffiZYbž'ia`X]Y$ I bZUggVUf_Y]h'XYg'J O`_Yfa cfXg'ni 'gma Vc`]g]YfYb"'I bhYf'XYa AU\baU`VYZ|bXYh`q]WX`Y]b`=bZcfaUh]cbgnYbhfiaž:XUg`dYfqÒb`]WXY ; $YgWX W hYb i cb CdZYfbž \]ghcf]gWXY8c_i a YbhYi bX$ 5 i gghY``i b[Yb'ni f'JYfZc`[i b['i bX'JYfb]W\hi b['XYf' $\stackrel{.}{\Rightarrow}$ XYb']b 9i fcdU'nY][h"'8Yf'Cfh'`ÀXh'ni f'gh]``Yb'FYZYI]cb'Y]b'i bX']gh'Y]b

_fUZhj c``Yg`NYi [b]g`XYf`XYi hgW\Yb`9f]bbYfi b[g_i `hi f"`9f j YfXYi h`]W\hž'k]Y`6Yf`]b`g]W\`gY]bYf`J Yf[Ub[Yb\Y]h`ghY``h`i bX [`Y]W\nY]h][`Y]b`NY]W\Yb`[Y[Yb`<Ugg`i bX` \pm bc`YfUbn`gYhnh"

6Y]XY'GhÀhhYbž'X]Y'; YXYb_ghÀhhY'6Yf']bYf'A UI Yf'I bX'XUg <c`cWUi gh!A U\ba U`ž'g]bX'a Y\f'U`g'bi f'hci f]gh]gWXY'5hhfU_h]cbYb g]Y'g]bX'CfhY'XYg'@YfbYbg'i bX'XYf'A U\bi b["'8]Y'6Yf']bYf'A UI Yf Yf]bbYfh'Ub'X]Y'HY]`i b['9i fcdUg'i bX'X]Y'CdZYf'XYg'?U`hYb ?f]Y[Ygž'k À\fYbX'XUg'<c`cWUi gh!A U\ba U`X]Y'i bYfa Ygg`]WXYb @Y]XYb'XYg'Nk Y]hYb'K Y`h_f]Y[g'i bX'X]Y'J YfUbhk cfhi b['ZØf'Y]bY Zf]YX`]WXY'Ni _i bZh'h\Ya Uh]g]Yfh"'G]Y'nY][Ybž'k]Y'6Yf']b'a]h'gY]bYf gWk]Yf][Yb'; YgWX]WXhY'i a [Y\hž']bXYa 'Yg'X]YgY'b]WXhj' YfXfÀb[hž gcbXYfb'g]WXhVUf'a UWXh"'9]b'6Ygi WX'Ub'X]YgYb'CfhYb']gh'cZh Ya ch]cbU`'VY`UghYbXž'UVYf'Ui WX'i b[Ya Y]b'k]WXh][ž'i a 'X]Y 6YXYi hi b['j cb':fY]\Y]hž'A YbgWX`]WX_Y]h'i bX'Ni gUa a Yb\U`h'ni j YfghY\Yb''8]Y'BÀ\Y'ni 'UbXYfYb'\]ghcf]gWXYb'GhÀhhYb'k]Y'XYa 6fUbXYbVi f[Yf'Hcf'cXYf'XYa 'FY]WXghU['Yfa Ò[']WXhYgž'X]Y j YfgWX]YXYbYb'9dcWXYb'6Yf`]bg']b'Y]bYa '[fÒ*YfYb'?cbhYl h'ni VYhfUWXhYb''

8]YgY`\]ghcf]gW\Yb`CfhY`g]bX`i bj Yfn]W\hVUfY`GhUh]cbYb`ZØf`YXYbž XYf`6Yf`]b`VYgi W\h'i bX`X]Y`GhUXh`b]W\h'bi f`U`g`a cXYfbY
A Yhfcdc`Yž`gcbXYfb`Ui W\`U`g`GW\Ui d`Uhn`YbhgW\Y]XYbXYf
K YbXYdi b_hY`XYf`K Y`h[YgW\]W\hY`Yf`YVYb`a ÒW\hY"`G]Y`V]YhYb
b]W\h'bi f`9]bV`]W_Y`]b`X]Y`JYf[Ub[Yb\Y]hž`gcbXYfb`fY[Yb`Ui W\
XUni `Ubž`ØVYf`X]Y`; Y[Ybk Ufh`i bX`Ni _i bZh`bUW\ni XYb_Yb"`6Yf`]b
nY][h`\]Yf`Y]bXfi W_gj c``ž`k]Y`Y]bY`GhUXh`Ui g`]\fYf`; YgW\]W\hY
`YfbYb`i bX`[`Y]W\nY]h][`Y]b`Cfh`XYf`<cZZbi b[`i bX`XYg
BYi UbZUb[q`qY]b`_Ubb"

; fØbY C UgYb]b XYf GhUXh



6Yf`]bžcZh'U`g`\Y_h]gW\Y`A Yhfcdc`Y`k U\f[Ybca a Ybž'ØVYffUgW\h a]h'Y]bYf': Ø``Y`Ub'[fØbYb'C UgYbž'X]Y`gck c\``9]b\Y]a]gW\Yb'U`g Ui W\`Hci f]ghYb'9f\c`i b[`i bX'9bhgdUbbi b[`V]YhYb"`A]h'ZUgh') \$`i ; fØbZÀW\Y`i bX`Yhk U`&") \$\$``OZZYbh`]W\Yb'DUf_g`i bX'; ÀfhYb']gh'X]Y GhUXh'Y]b'DUfUX]Yg`ZØf'B Uhi f`]YV\UVYf"`Ni `XYb'gW\ObghYb'i bX VYXYi hYbXghYb'[Y\OfYb'XYf'H]Yf[UfhYb'i bX'XUg'HYa dY`\cZYf : Y`Xž'X]Y`b]W\h'bi f'Xi fW\']\fY; fO`>Y`i bX'GW\Ob\Y]h VYY]bXfi W_Ybž'gcbXYfb'Ui W\'Y]bY`k]W\h][Y`Fc``Y'U`g FØW_ni [gcfhY']ba]hhYb'XYg'i fVUbYb'Hfi VY`g'gd]Y`Yb"'8]YgY'DUf_g g]bX'C fhY'XYf'Fi \Yž'XYf': fY]nY]h[YghU`hi b[`i bX'XYf'6Y[Y[bi b[ž X]Y'XUg'@YVYb']b'6Yf`]b'VYfY]W\Yfb"

8 Yf'H]Yf[UfhY bž'6Yf']bg'nYbhfU`Yf'DUf_ž'YfghfYW_h'g]W. 'ØVYf') %< Y_hUf'i bX'`]Y[h'X]fY_h']a '< YfnYb'XYf'GhUXhž']b'i ba]hhY`VUfYf

BÀ\Y'ni 'K U\fnY]W.Yb'k]Y'XYa '6fUbXYbVi f[Yf'Hcf"'I fgdfØb[`]W.

]a '%+"'\J\f\i bXYfh'U`g'\J[X[YV]Yh'ZØf'X]Y'dfYi »]gW.Yb'? Ob][Y

Ub[Y`Y[hž'k i fXY'Yf'gdÀhYf'ni 'Y]bYa 'OZZYbh']W.Yb'DUf_
i a [YghU`hYh''< Yi hY']gh'XYf'H]Yf[UfhYb'Y]b'VY`]YVhYf'HfYZZdi b_h'ZØf

&[[Yfž'GdUn]Yf[Àb[Yf'i bX': Ua]`]Ybž'X]Y'\]Yf'D]W_b]W_g

j YfUbghU`hYb'cXYf'Y]bZUW. 'X]Y'BUhi f'[Yb]Y » Yb"'8 Yf'DUf_'V]YhYh

nU\`fY]W.Y'K UbXYfk Y[Yž'Gd]Y`d`AhnY'i bX'gc[Uf'6YfY]W.Y'ZØf

<i bXYž'k Ug']\b'ni 'Y]bYa 'j]Y`gY]h][Yb'9f\c`i b[gcfh'a UW.h''
6YgcbXYfg']a 'Gca a Yf'j Yfk UbXY`h'g]W. 'XYf'H]Yf[UfhYb']b'Y]bY

6Ø\bY'ZØf'_i `hi fY``Y'J YfUbghU`hi b[Ybž'XUfi bhYf': Y]Yfb'ni a

@ 6HE Ž'Df]XY"'8]Y'k Y]h`Ai Z][Yb'K]YgYb'i bX'gW.Uhh][Yb

6Ui a U``YYb``UXYb`ni a `JYfk Y]`Yb`Y]bž'k À\fYbX`_`Y]bY`GYYb`i bX

K UggYf`Ài ZY`XYa `DUf_`Y]bY`]Xm``]gW\Y`5ha cgd\ÀfY`j Yf`Y]\Yb"`8Yf

H]Yf[UfhYb`]gh'b]W\h'bi f`Y]b`Cfh'XYf`9bhgdUbbi b[ž'gcbXYfb`Ui W\
Y]b`\]ghcf]gW\Yg`NYi [b]g`XYf`GhUXhYbhk]W_`i b[`6Yf`]bgž'XUg

6Ygi W\Yf`i bX`9]b\Y]a]gW\Y`[`Y]W\Yfa U»Yb`gW\ÀhnYb": Øf

k Y]hYfY`\dangle Zcfa Uh]cbYb`ni `6Yf`]bg`[fØbYb`CUgYbž'Y]bgW\`]Y»`]W\
XYg`H]Yf[UfhYbgž'`c\bh`g]W\Y]b`6`]W_`Ui Z'X]Y`, VYfg]W\h'VY]`@cbY`m

D`UbYh"

9]bY'kY]hYfY'Ui»Yf[YkÒ\b`]W\Y'; fØbZÀW\Y']gh'XUg'HYa dY`\cZYf : Y`Xž'XUg'Ui Z'XYa '; Y`ÀbXY'XYg'Y\Ya U`][Yb': `i [\UZYbg $HYa dY \ CZYbhghUbXYb \]gh"BUWX XYf GWX]Y > i b[XYg : i [\UZYbg]$]a '\\f'&\\$, 'k i fXY'XUg', -\\$'<Y_hUf'[fc\)Y'5fYU`']b'Y]bYb]bbYfghÀXh]gWXYb DUf g XYf K Y h [] h 8 Ug HYa dY \ c ZYf : Y X]gh Y]b'Y]bn][Ufh][Yf'Cfhž'XYf'; YgWX]WXhY'i bX': fY]nY]h'| YfY]bh.'9g'k Uf Y]bgh'GhUbXcfh'Y]bYg'?cbnYbhfUh]cbg`U[Yfgž'Y]bYf'l G!5fa YY!6Ug]g $\label{eq:control_for_f} i \ b \ X' \ X' \ b \ b \ Y' \ b \ W' \$ $XYf^{`6}Yf^{`}]b!6^{`}cW_UXY''^{`}<Yi\ hY^{`}]gh^{`}Yg^{`}Y]b^{`}< c\,hgd\,c\,h^{`}Z\!0\!0f^{`5}_h]j\]h\grave{h}Yb^{`}k\]Y$ $FUXZU\ fYbz=b^b\ bY!G_Uh]b[z; f]``Yb'ibX'gc[Uf'HYW\bc!DUfhmgz'X]Y$ $X[Y] \subset ZZYbY \cap bX \subseteq fYUh] \mid Y \cap b \cap cgd \setminus AfY \cap b \cap b \cap k \mid XYfgd \mid Y \mid Y \cap b \mid B \mid Y$ kY]hYbžcZZYbYb': `ÀWXYb'V]YhYb'FUi a 'ZØf'Gdcfh'i bX 9bhqdUbbi b[žk À\fYbX XUq \]qhcf]qWXY HYfa]bU`[YVÀi XY Ub X]Y JYf[Ub[Yb\Y]hYf]bbYfh"6YgcbXYfg'Ub'K cW\YbYbXYb'ghfÒa Yb A YbgWXYb $^{\prime}$ Yf\Yfži a $^{\prime}$ 8 fUWXYb $^{\prime}$ ghY][Yb $^{\prime}$ ni $^{\prime}$ UggYb $^{\prime}$ cXYf $^{\prime}$ Y]bZUWX $X[Y: fY] \setminus Y[h:ni: [Yb]Y \Rightarrow Ybž:X[Y:X]YgYf:f]Yg][Y:FUi:a: [Yfa]hhY:h":8Ug$ HYa dY`\cZYf: Y`X`]gh'Y]b'Gma Vc``ZØf'6Yf`]bg'K UbXY`` 'j cb'Y]bYa Cfh'XYf'HY]`i b['i bX'Bch'ni 'Y]bYa 'FUi a 'XYf'; Ya Y]bqW\UZh'i bX XYq'A]hY]bUbXYfg"'9g'nY][hž'k]Y'X]Y'GhUXh']\fY'; YgWX]WXhY VYk U\fh'i bX'[`Y]W\nY]h]['bYi Y'Bi hni b[Yb'ZØf'U`hY'CfhY'Z]bXYh"

6Y]XY'DUf_g'gd]Y`Yb'Y]bY'nYbhfU`Y'Fc``Y']a '@YVYb'XYf'6Yf`]bYf i bX'g]bX'Ui W\'ZØf'Hci f]ghYb'i bj Yfn]W\hVUfY'N]Y`Y''8Yf'H]Yf[UfhYb V]YhYh'Y]bY'_`Ugg]gW\Y'DUf_Uha cgd\AfY'a]h'Y]bYf'A]gW\i b['Ui g B Uhi f'i bX'?i `hi fž']XYU`'ZØf'Y]bYb'YbhgdUbbhYb'GdUn]Yf[Ub['bUW\XYa '6Ygi W\'\]ghcf]gW\Yf'Gh\AhhYb']b'XYf'B\A\Y''8Ug'HYa dY`\cZYf': Y`X'\]b[Y[Yb'ghY\h'ZØf'X]Y'i b_cbj Ybh]cbY``Y'GY]hY'6Yf`]bg''Y]b Cfh\zeta'Ub'XYa 'FY[Y`b'`cW_YfYf'g]bX'i bX'?fYUh]j]h\ah'[YZY]Yfh'k]fX''

6Y]XY; fØbZÀWXYb;g]bX;"Y]WXha]h;ÖZZYbh;]WXYb;JYf_Y\fga]hhY;b YffY]WXVUf;i bX;V]YhYb;5bbY\a `]WX_Y]hYb;k]Y;D]W_b]W_VYfY]WXYž Gdcfha Ò[`]WX_Y]hYb;i bX;cZh;Ui WX;ÖZZYbh;]WXY;Hc];YhhYb;"G]Y;g]bX CfhYž;Ub;XYbYb;a Ub;XYa;Hfi VY;"XYf;GhUXh;YbhZ]Y\Yb;i bX;X]Y GYY;Y;VUi a Y;b;"UggYb;_Ubbž;gY];Yg;VY];Y]bYa;[Ya Øh;]WXYb GdUn]Yf[Ub[ž;Y]bYf;FUXhci f;cXYf;Y]bZUWX;VY]a;6YcVUWXhYb;XYg;YVYbX][Yb;HfY]VYbg;i a 'Y]bYb;\Yfi a "

8]Y'DUf_g'i bX'; ÀfhYb'6Yf`]bg'g]bX'a Y\f'U`g'bi f'[fØbY': `YW_Yb Ui Z'XYf'@UbX_UfhY' g]Y'g]bX'YggYbn]Y``ZØf'XUg'K c\`VYZ]bXYb'XYf A YbgWXYb'i bX'hfU[Yb'ni f'@YVYbgei U`]hÀh']b'XYf' < Ui dhghUXh'VY]" G]Y'V]YhYb'F Ui a 'ZØf'9f\c`i b[ž'Gdcfh'i bX'gcn]U`Y' +bhYfU_h]cb'i bX g]bX'cZh'GWX Ui d`ÀhnY'ZØf'_i `hi fY``Y'9j Ybhgž'X]Y'X]Y'J]Y`ZU`h'XYf GhUXh'k]XYfgd]Y[Y`b''8Yf'H]Yf[UfhYb'i bX'XUg'HYa dY`\cZYf': Y`X g]bX'bi f'nk Y]'6Y]gd]Y`Y'ZØf'X]Y'j]Y`Yb'[fØbYb'GWXÀhnY'6Yf`]bgž'X]Y XUfUi Z'k UfhYbž'YbhXYW_h'ni 'k YfXYb'''G]Y'nY][Ybž'k]Y'X]Y'GhUXh BUhi f'i bX'I fVUb]hÀh']b'9]b_`Ub['Vf]b[h'i bX'YXYa '6Ygi WXYf'X]Y A Ò[`]WX_Y]h'[]Vhž'Y]bY'DUi gY'Y]bni `Y[Yb'i bX'X]Y'5ha cgd\ÀfY 6Yf`]bg'Ui Z'Y]bY'[Ubn'VYgcbXYfY'K Y]gY'ni 'Yf`YVYb''

 $5 fWX]hY _hcb]gWX Y J]Y ZU h$



6Yf`]b`]gh'Y]bY`GhUXhž'X]Y`UfW\]hY_hcb]gW\`gc`j]Y`Z\\`h][`]gh'k]Y`]\fY
; YgW\]W\hY"\8]Y`< Ui dhghUXh\8Yi hgW\`UbXg`gd]Y[Y`h`]b`]\fYa
GhUXhV]`X`Y]bY`VYY]bXfi W_YbXY`6UbXVfY]hY`Ub`6Ui gh]`Yb`k]XYfž
X]Y`j cb`_`Ugg]n]gh]gW\Yb`A\Y]ghYfk\Yf_Yb`ØVYf`dfYi »]gW\Y
DfUW\hVUi hYb`V]g`\]b`ni 'a cXYfbYbž']bbcj Uh]j Yb`?cbghfi _h]cbYb
fY]W\h"\8]YgY\8]j\Yfg]h\h'df\[\alpha\f\\alpha\f\\alpha\h'\

8 Yf? `Ugg]n]ga i gʻ]gh'Y]bYf'XYf'dfÀ[YbXghYbʻ6Ui gh]`Yʻ]bʻ6Yf`]bg \]ghcf]gWXYfʻ5fWX]hY_hi fž']bgVYgcbXYfYʻ]a '%, "ʻi bXʻZfØ\Yb'%-"

*J\f\i bXYfh"ʻ9]bʻ]_cb]gWXYgʻ6Y]gd]Y`ʻ]gh'XUgʻ6fUbXYbVi f[YfʻHcfž
Ybhk cfZYbʻj cbʻ7Uf`; chh\UfXʻ@Ub[\Ubgʻi bX'nk]gWXYbʻ%+, , 'i bX
%+-%'YfVUi h"ʻ\bgd]f]Yfhj cbʻXYbʻDfcdm`AYbʻXYfʻ5_fcdc`]gʻ]bʻ5h\Ybž
j Yf_ÒfdYfh'Ygʻa]hʻgY]bYbʻXcf]gWXYbʻGÀi `Ybʻi bXʻXYfʻ_`UfYbž
gma a Yhf]gWXYbʻGhfi _hi fʻX]Yʻ\b`]WX`VYY]bXfi W_YbX`]gh'XUgʻ5`hY
A i gYi a 'Ui ZʻXYfʻA i gYi a g]bgY`žʻY]bʻK Yf_j cbʻ?Uf`: f]YXf]WX

GWW.]b_Y`ž'XUg'a]h'gY]bYf'a cbi a YbhU`Yb'GÀi `YbZfcbh'i bX'XYf ghfYb[Yb'; Yca Yhf]Y'XYb'_`Ugg]n]gh]gWW.Yb'Gh]`'dYfZY_h fYdfÀgYbh]Yfh"'8]YgY'6Ui hYb'k UfYb'b]WW.h'bi f'5i gXfi W_'XYg dfYi »]gWW.Yb'GY`Vghj YfghÀbXb]ggYgž'gcbXYfb'Ui WW'Y]b'JYfgi WW.ž 6Yf`]b'U`g'_i `hi fY``Y'< Ui dhghUXh'9i fcdUg'ni 'YhUV`]YfYb''G]Y dfÀ[Yb'V]g'\Yi hY'XUg'GhUXhnYbhfi a 'i bX'ghY\Yb']a '?cbhfUgh'ni XYb'gdÀhYfYbž'cZh'Yl dYf]a YbhY``YfYb'6Ui gh]`Ybž'X]Y'bUWW'XYb NYfghÒfi b[Yb'XYg'?f]Y[Yg'i bX'XYf'HY]`i b['YbhghUbXYb''

8]Y 'HY]'i b['6Yf']bg'ZØ\fhY'ni 'Y]bYf'k Y]hYfYb'8]j Yfg]Z]n]Yfi b['XYf 6Ui gh]'Yž'XU'Cgh!'i bX'K Ygh!6Yf']b'i bhYfgW\]YX`]W\Y'\RYC\c[]Yb i bX'D\Ubi b[gUbg\hany'j YfZc\[hYb''\=a 'CghYb'gYmhY'X]Y'88F'Ui Z gcn]U\]gh]gW\Yb'FYU\]ga i g'i bX'gd\hYf'Ui Z'D\UhhYbVUi k Y]gY\z'k]Y a Ub'Yg'Ybh'Ub['XYf'?Uf\!A Ufl!5\`YY'gY\Yb'_Ubb\z'k c a cbi a YbhU'Y'K c\bV\cW_g'i bX'VfY]hY'GhfU\rangle Yb'XUg'6]\X'XYf gcn]U\]gh]gW\Yb'< Ui dhghUXh 'df\hangle [Yb'gc\`hYb''\=a 'K YghYb'\]b[Y[Yb Yl dYf]a Ybh]YfhY'a Ub'a]h'a cXYfbYf'5fW\]hY_hi fz'X]Y : i b_h]cbU\]h\hangle b\Y\fbUh]cbU\]h\hani bX'\Relation hYfbUh]cbU\]h\hanvYhcbhY\z'Yhk U'VY]'XYf < UbgUj]YfhY\!G]YX\`i b[\z'X]Y']a 'FU\a Yb'XYf'\Relation hYfVUi '%-) +'j cb]bhYfbUh]cbU\Yb'5fW\]hY_hYb'k]Y'\@Y'7cfVi g]Yf'[YghU\hYh'k i fXY'' BUW\X'XYf'K]YXYfj YfY]b][i b['%- - \xik i fXY'6Yf\]b'ni f'\6\Ø\bY'Z\Øf]bbcj Uh]j Yz'nY]h[Yb\Ogg]gW\Y'5fW\]hY_hi f''\8\Yf'DchgXUa Yf'D\Uhn\z'Yb\B\BY\BU\X'UbX'UbX'Ub'XYf'A Ui Yfz'k i fXY']b'XYb'%- - \xiYf!\z\JY\fYb

ni 'Y]bYa 'Gma Vc`'XYg'bYi Yb'6Yf`]bg'a]h'Zi hi f]gh]gW\Yb'; YVÀi XYb k]Y'XYa 'Gcbm'7YbhYf'j cb'< Y`a i h'>U\b"'8]YgY'a cXYfbYb ?cbghfi _h]cbYb'Ui g'; `Ug'i bX'GhU\`'ghY\Yb'ZØf'CZZYb\Y]h'i bX :cfhgW\f]hhž'_cbhfUgh]YfYb''YXcW\''ghUf_'a]h'XYb'\]ghcf]gW\Yb .VYffYghYb'XYf'GhUXh"

8]Y 'UfW,]hY_hcb]gW, Y 'J]Y 'ZU'h'6Yf']bg']gh'b]W, h'bi f'Àgh\Yh]gW, ž gcbXYfb'Ui W. 'Z b_h]cbU'i bX'gcn]U''VYXYi hgUa "'K]Y ']a

5 fW,]hY_hi f!@YI]_cb'VYgW, f]YVYbž'i a ZUggh'8]j Yfg]hÀh']b'XYf

5 fW,]hY_hi f'X]Y '6YfØW_g]W, h][i b['j YfgW,]YXYbYf'6YXØfZb]ggY'i bX
_i 'hi fY''Yf'=XYbh]hÀhYbž'k Ug']b'6Yf']b'VYgcbXYfg'g]W, hVUf'k]fX"

J cb'VUff]YfYZfY]Yb'OZZYbh']W, Yb'; YVÀi XYb'V]g'\]b'ni

bUW, \U'h][Yb'BYi VUi hYb'k]Y'XYa' < Ui dhVU\b\cZž'XYf'&\$\$*

YfOZZbYh'k i fXYž'nY][h'X]Y'GhUXhž'k]Y'5fW,]hY_hi f']b_'i g]j Y'i bX

UbdUggi b[gZÀ\][Y'FÀi a Y'gW, UZZYb'_Ubb''': Øf'Y]bYb'h]YZYfYb

9]bV']W_']b'XUg'?cbnYdh'XYf'UfW,]hY_hcb]gW, Yb'8]j Yfg]hÀh'c\bh
g]W, Y]b'6`]W_'Ui Z'X]Y'Ui gZØ\f']W, Y'9f_'Àfi b['VY]'5 fW,]hY_hi f!

@YI]_cb'''8]YgY'J]Y'ZU'h'dfÀ[h'XUg'GhUXhV]'X'6Yf']bg'i bX'a UW, h'Yg

ni 'Y]bYa 'YVYbX][Yb'A cgU]_ž'XUg'J Yf[Ub[Yb\Y]h'i bX'Ni _i bZh
j YfV]bXYh''

8]Y'i bhYfgW\]YX`]W\Yb'6Ui gh]Y'6Yf`]bg'VYY]bZi ggYb'XUg'GhUXhV]X
Ui Z'Y]bn][Ufh][Y'K Y]gY. 'K À\fYbX'X]Y'_`Ugg]n]gh]gW\Yb'i bX
\]ghcf]gh]gW\Yb'6Ui hYb'XYa 'NYbhfi a 'Y]bY'[Yk]ggY'K ØfXY'i bX
?cbh]bi]hÀh'j Yf'Y]\Ybž'Vf]b[Yb'X]Y'a cXYfbYb'?cbghfi _h]cbYb
8 mbUa]_'i bX'*bbcj Uh]cb"'8]YgY'A]gW\i b['a UW\h'6Yf`]b'ni 'Y]bYf
GhUXhž'X]Y'g]W\h'Ui Z'Y]bYb'Y]bn][Yb'Gh]`'ZYghY[Yb'`Àgghž
gcbXYfb'ghÀbX][']a 'K UbXY`'VY[f]ZZYb']gh"'*XYYf'6Ui gh]`'YfnÀ\`h
Y]bY'; YgW\]W\hY' 'gY]'Yg'j cb'dfYi *]gW\Yf'A UW\hž'j cb'HY]`i b['i bX
K]YXYfUi ZVUi 'cXYf'j cb'XYf'J]g]cb'Y]bYf'[`cVU'Yb'A Yhfcdc'Y"': Øf
6Ygi W\Yf'V]YhYh'X]YgY'UfW\]hY_hcb]gW\Y'J]Y`ZU'h'Y]bY
ZUgn]b]YfYbXY'FY]gY'Xi fW\X]Y'NY]hž'VY]'XYf'a Ub'Ub'YXYf'9W_Y
bYi Y'DYfgdY_h]j Yb'YbhXYW_h"'6Yf`]b']gh'gca]h'b]W\h'bi f'Y]b'Cfh
XYf'; YgW\]W\hYz'gcbXYfb'Ui W\Y]b''YVYbX][Yg'6Y]gd]Y`'XUZØfz'k]Y
5fW\]hY_hi f'XUg'@YVYb'i bX'X]Y'*XYbh]hÀh'Y]bYf'GhUXh'dfÀ[Yb'_Ubb''

JYfVcf[YbY'GWXÀhnY



6Yf`]b']gh'nk Y]ZY``cg'ZØf'gY]bY'k Y`hVYfØ\a hYb

GY\Ybgk ØfX][_Y]hYb'k]Y'XUg'6fUbXYbVi f[Yf'Hcf'cXYf'XYb

FY]WXghU['VY_Ubbhž'XcWX'X]Y'< Ui dhghUXh'\Uh'k Y]h'a Y\f'ni

V]YhYbž'U`g'X]Y'ØV`]WXYb'Hci f]ghYbdZUXY'j Yfa i hYb'`UggYb''5VgY]hg

XYf'Ui g[YhfYhYbYb'K Y[Y'jYfVYf[Yb'g]WX'ZUgn]b]YfYbXY'CfhY'i bX

; Y\Y]a h]ddgž'X]Y'Y]bYb'UbXYfYbž'cZh']bh]a YfYb'6`]W_'Ui Z'X]Y'GhUXh

Yfa Ò[`]WXYb''8]YgY'k Yb][Yf'VY_UbbhYb'GhÀhhYb'YfnÀ\`Yb

; YgWX]WXhYb'j cb'6Yf`]bg'J Yf[Ub[Yb\Y]hž'gY]bYf'?fYUh]j]hÀh'i bX

gY]bYf': À\][_Y]hž'g]WX']a a Yf'k]YXYf'bYi 'ni 'YfZ]bXYb'': Øf

FY]gYbXYž'X]Y'XUg'I b[Yk Ò\b`]WXY'gi WXYbž'V]YhYb'X]YgY

j YfghYW_hYb'DYf`Yb'i bj Yf[Ygg`]WXY'9f`YVb]ggY'ZYfbUV'XYf'A UggYb''

`Y]bYg`\DZcfa Uh]cbgnYbhfi a `Yf`Àfh`X]Y`; YgW\]W\hY`XYg
6Ui k Yf_gži bX`j cb`Y]bYf`5i gg]W\hgd`UhhZcfa `Ui g`_Ubb`a Ub`XYb
a Ugg]j Yb`Nm`]bXYf`Ui g`XYf`BÀ\Y`VYhfUW\hYb": Øf`U``Yž`X]Y`g]W\`ZØf
i b[Yk Ò\b`]W\Y`\]ghcf]gW\Y`GhÀhhYb`]bhYfYgg]YfYbž`]gh`X]YgYf`Cfh
Y]b`A i gg"`A Y\f`ØVYf`gc`W\Y`g_i ff]`Yb`i bX`j YfVcf[YbYb`CfhY`]b
8 Yi hgW\`UbXž`Y]bgW\`]Y»`]W\`XYg`GW\k YfVY`Ughi b[g_ÒfdYfgž`Z]bXYh
q]W\`]bYf`qdUbbYbXYb`GUa a `i b[`VY]`FY]qYfYdcfhYf"

9]b k Y]hYfYf Zugn]b]YfYbXYf Cfh UVgY]hg XYf Hci f]ghYbghfÒa Y]gh XYf'GdfYYdUf ']a 'GhUXhhY]`HfYdhck "'8]YgYf'j Yf'UggYbY : fY]nY]hdUf_ž'XYf'%- * - ']b 'XYf'88F!NY]h'YfÒZZbYh'k i fXYž'kUf'Y]bgh $Y = VY^{Y} = VY^{Y}$ XYf`DUf_`&\$\$%`Ui Z[fi bX`Z|bUbn]Y``Yf`GW\k]Yf][_Y]hYbž`i bX gY]hXYa 'j YfZÀ``h'XUg'; Y`ÀbXY'`Ub[gUa ž'k Ug']\a 'Y]bY [YadYbah]aW\YžZUahiqi ffYU`Y`5ha cad\ÀfYi Yf`Y]\h"JYffcahYhY 5 WX hY fV U\ b Y b ž Y]b 'gh]``ghY\ Y b X Y g 'F]Y g Y b f U X 'i b X 'ØV Y f k i WX Y f h Y KY[YaUWXYb'XYb'GdfYYdUf_'ni'Y]bYa'DUfUX]Yg'ZØf'IfVUb 9I d`cfYf'i bX': chc[fUZYbž'X]Y'XUg'JYfZU``YbY'i bX'JYf[YggYbY $ZYgh\setminus U`hYb'a OWAhYb"`CVkc\setminus``XYf`Nihf]hh`cZZ]n]Y```Y]b[YgWAfAb h$]ghžk YfXYb [Y`Y[Ybh`]WX [YZØ\fhY 'Hci fYb 'Ub[YVchYbž'X]Y 'Y]bYb g|WXYfYb '9|bV`|W_ '|b 'X|YgY 'V|nUffY 'K Y`h'Yfa Ò[`|WXYb" 8Yf GdfYYdUf_']gh'Y]b'gh]``Yg'NYi [b]g'XYf'K YbXYnY]h'i bX'nY][hž'k]Y 6Yf]b'a]h'XYb', VYffYghYb'gY]bYf'[YhY]hYb'JYf[Ub[Yb\Y]h ia [Y\h' Y]b CfhžXYf nia BUWXXYb Yb UbfY[hibX [`Y]WXnY]h][ZUgn]b]Yfh"

: Øfr?i bgh! i bX ?i `hi f]bhYfYgg]YfhY 'V]YhYh'X]Y 'GUa a `i b['6cfcg']a GhUXhhY]``A]hhY 'Y]bY 'Y]bn][Ufh][Y '9fZU\fi b["'8]YgY 'df]j UhY ?i bghgUa a `i b[']gh']b 'Y]bYa 'Y\Ya U`][Yb '@ ZhgWXi hnVi b_Yf'Ui g XYa 'Nk Y]hYb 'K Y`h_f]Y['i bhYf[YVfUW hž'XYf'gdÀhYf']b 'XYf'88F'U`g @U[Yf'[Ybi hnh'k i fXY'i bX 'bUW 'XYf'K YbXY'ni 'Y]bYa 5i gghY``i b[gfUi a 'i a [YVUi h'k i fXY"'8Yf'6YhcbVUi 'Ub'g]WX']gh gWXcb'Y]b 'UfWX]hY_hcb]gWXYg'<][\`][\hž'XcWX'X]Y'nY]h[YbÒgg]gWXYb ?i bghk Yf_Yž'X]Y'\]Yf'Ui g[YghY``h'k YfXYbž'a UWXYb 'XYb'6Ygi WX i bj Yf[Ygg`]WX"'8]Y'GUa a `i b['i a ZUggh'K Yf_Y']bhYfbUh]cbU`Yf ?ØbghYf'k]Y'C`UZ f'9`]Uggcb'cXYf'5]'K Y]k Y]'i bX'k]fX'fY[Y`a À»][U_hi U`]g]Yfh"'8U'X]Y'6Ygi WXYfnU\``VY[fYbnh']ghž'a i gg'a Ub'g]WX i cfUV'ZØf'Y]bY': Ø\fi b['Uba Y`XYbž'k Ug'XYb'6Ygi WX'ni 'Y]bYa

YI_`i g]j Yb '9f`YVb]g`a UW\h" '8]Y '?ca V]bUh]cb 'Ui g`fc\Yf 6i b_YfÀgh\Yh]_'i bX 'a cXYfbYf'?i bgh'gW\UZZh'Y]bY '5 ha cgd\ÀfYž X]Y 'a Ub ']b'_Y]bYa '_`Ugg]gW\Yb 'A i gYi a 'Z]bXYhž'i bX 'nY][h'6Yf`]bg HU`Ybhž'U`hY 'Ghfi _hi fYb 'bYi 'ni ']bhYfdfYh]YfYb"

9]b k Y]hYfYf j YfghY W_hYf GW Uhn]gh XYf? i b_Yf_fUb]W žY]b
Fcc Zhcd!; UfhYb i bX ?i `hi fcfh'Ui Z'XYa '8 UW Y]bYg DUf_\Ui gYg]a
GhUXhhY]`BYi _O``b" 8]YgYf C fh']gh Y]b YW hYg 6Yf`]bYf C f][]bU`.
<]Yf hf]Zh I fVUb; UfXYb]b['Ui Z'U`hYfbUh]j Y ?i `hi f" 6Ygi W Yf
_ObbYb nk]gW Yb < cW VYYhYb i bX 8 +M A OVY`b Ybhgd UbbYbž
Y]bYb 8f]b_ [Yb]Y » Yb i bX XYb 6`]W_ ØVYf X]Y GhUXh gW k Y]ZYb
`UggYb" 6YgcbXYfg]b XYb Gca a Yfa cbUhYb Z]bXYb `\]Yf ?cbnYfhYž
:`c\a Af_hY i bX :]`a UVYbXY ghUhhž X]Y Y]bY Ybhgd UbbhYž _fYUh]j Y
5ha cgd\AfY gW UZZYb" 8Yf ?`i b_Yf_fUb]W ']gh Y]b '6Y]gd]Y` ZØf
6Yf`]bg ``YVYbX][Y Gi V_i `hi f i bX XYb ; Y]gh XYf ; Ya Y]bgW UZhž XYf
]b 'j]Y `Yb '9W_Yb XYf GhUXh gd Øf VUf]gh" '9g `]gh Y]b 'C fhž Ub XYa 'a Ub
XUg 'YW hYž i bdc `]YfhY 6Yf`]b 'Yf YVhž ZYfb UV 'j cb 'hci f]gh]gW Yb
< chgdchg"

8]YgY'k Yb][Yf'VY_UbbhYb'GY\Ybgk ØfX][_Y]hYb'i bX'; Y\Y]a h]ddg
V]YhYb'Y]bYb'[Ubn'UbXYfYb'6`]W_'Ui Z'6Yf`]b' 'Y]bYbž'XYf'X]Y'GhUXh
YbgY]hg'XYf'Dcgh_UfhYba ch]j Y'nY][h''G]Y'YfnÀ\`Yb'j cb
j Yf[YggYbYb'; YgW\]W\hYbž'U'hYfbUh]j Yb'@YVYbgk Y]gYb'i bX'XYf
: À\][_Y]h'6Yf`]bgž'g]W\']a a Yf'k]YXYf'bYi 'ni 'YfZ]bXYb'''CV'Yg'X]Y
XØghYfY'JYf[Ub[Yb\Y]h'XYg'GW\kYfVY`Ughi b[g_O`fdYfg']ghž'X]Y
a Y`UbW\c`]gW\Y'GW\O`b\Y]h'XYg'GdfYYdUf_gž'X]Y'_Øbgh`Yf]gW\Y
\dipocityb''' b_Yf_GUa a `i b['6cfcg'cXYf'X]Y'YbhgdUbbhY'?fYUh]j]h\h
XYg'?`i b_Yf_fUb]W\g' 'X]YgY'CfhY'`UXYb'XUni 'Y]bž'6Yf`]b'a]h
UbXYfYb'5i [Yb'ni 'gY\Yb''': Øf'FY]gYbXYž'X]Y'XUg'6YgcbXYfY
gi W\Ybž'g]bX'X]YgY'j YfghYW_hYb'GW\AhnY'XYf'dYfZY_hY'K Y[ž'X]Y
GYY`Y'XYf'GhUXh'ni 'YbhXYW_Yb'i bX'i bj Yf[Ygg`]W\Y'9f]bbYfi b[Yb
a]h'bUW\'<Ui gY'ni 'bY\a Yb''

- \ hhdg. ##Yb "k]_]d Y X] U "cf[#k]_]#6 f U b X Y b V i f [S; U h Y
- \hhdg.##a cbi a Ybhg"Zf#U``Ya U[bY#UbX!XY! VYf`]b#VYf`]b#dcfhY!XY!VfUbXYVci f[#
- \hhdg.##Yb"a "k]_]dYX]U"cf[#k]_]#A i gYi a S=g`UbX
- $\hd g. \# k k "j]g]hVYf^]b"XY#Yb#YUgh!g]XY![U^Yfm]$
- \ hhdg. ##Yb"a "k]_]dYX]U"cf[#k]_]#6Yf`]bSK U``
- \hhdg.##XY"a "k]_]dYX]U"cf[#k]_]#6Yf`]bYfSA Ui Yf
- \hhdg.#k k k "`cbY`md`UbYh"Wca #Ufh]WYg#VYgh!dUf_g!]b!VYf`]b
- \ hhd g. ##V Y f`]b %\$ "Wc a #d Uf_g#
- \hhdg.##k k k "UfWX]hY_hi f!`YI]_cb"XY#Wa g#YI]_cb# +
 !`YI]_cb!X#) \$*\$!X]j Yfg]hUYh"\ha `
- \hhdg.##k k k "U`hYg!bYi `UbX!
 ZfUb_Zi fh"Wca #[YVUYi XY!Vfi YW_Yb#UfWX]hY_hi f
- \hhdg.#k k k "WbhfUj Y``Yf"XY#Ufh]_Y`#Ui ggYf[Yk cY\b`]WXY!fY]gYn]Y`Y!XYi hgWX`UbX
- \ hhdg.##k k k "fY]gYfYdcfhYf"XY#fY]gYn]Y`Y#Yi fcdU#XY i hgWX`UbX# Yffi YW_hY!cfhY!]b!XYi hgWX`UbX!Ui g[YZU` `YbY!Ui gZ`i [gn]Y`Y!Zi Yf! UVYbhYi Yf!' (+F6DC*) D =< = 579; MJ6)) @E: "\ ha`</p>

8 Y hU]`g

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