

8]Y'@]b_Y']b'XYf'?f]gY.'5i ghf]hhY'i bX'XYf GWXUhhYb'XYg'5bh]gYa]h]gaig

9bhXYW_Yb'G]Y'X]Y'U_hi Y``Yb'<YfUi gZcfXYfi b[Yb'XYf@]b_gdUfhY]']b'8Yi hgW\`UbX"'BUW\'XYa 'DUfhY]hU[']b'<U``Ygcf[h'XYf'5i ghf]hh'j cb'ZØbZ'5V[YcfXbYhYb'ZØf'hi fVi `YbhY8]g_i gg]cbYb'ØVYf'5bh]gYa]h]ga i g'i bX'XYb'BU\cgh!?cbZ]_h"8Yf'5fh]_Y``VY`Yi W\hYh'X]Y'Ya ch]cbU`Yb'i bX'dc`]h]gW\YbGdUbbi b[YbžX]Y'a]h'X]YgYb'H\Ya Yb'j YfVi bXYb'g]bXž'i bXX]g_i h]Yfh'X]Y'Bchk YbX][_Y]h'Y]bYf'_`UfYb'Dcg]h]cb]Yfi b['XYfDUfhY]']a'<]bV`]W_'Ui Z'[YgY``gW\UZh`]W\Y'I b[`Y]W\\Y]hYb'i bXUbghY\YbXY'K U\`Yb"



8]Y'@]b_Y'ghY\h'Ua '5V[fi bX'BUW\'XYa 'DUfhY]hU[']b'<U``Yž'XYf
ZØf'j]Y`Y'<cZZbi b[Yb'gcf[hYž'Zc`[h'bi b'XYf'GW\cW_.'9]b'_c``Y_h]j Yf
5i ghf]hh'j cb'ZØbZ'dfca]bYbhYb'5V[YcfXbYhYb'Ui g'6Yf`]b'k]fZh'X]Y
DUfhY]']b'Y']bY'Yl]ghYbn]Y``Y'?f]gY"'D`Òhn`]W\']gh'XYf'GW\ki b['XYg
5i ZVfi W\g'k]Y'kY[[YV`UgYbž'X]Y'DUfhY]'g]hhh'h]YZ']a 'GW\`Ua UggY`"
9g'ghY\h'_`Uf'Ui Z'XYf'HU[YgcfXbi b[.'8]Y'8YVUhhYb'i a
5bh]gYa]h]ga i g'i bX'XYb'BU\cgh!?cbZ]_h'g]bX'Yl d`cg]j 'i bX

8]Y 'Ya ch]cbU'Y '6Y`Ughi b['_ObbhY'b]Wkh'[fO) Yf'gY]b "5b[Yg]Wkhg XYf'XYi hgWkYb"; YgWk]WkhY'i bX'XYf'XfUa Uh]gWkYb : Ua]`]Yb[YgWk]WkhYbž'X]Y'g]Wk'nk]gWkYb =gfUY`i bX'DU`Àgh]bU gdUbbYbž'`Àggh'g]Wk'Y]b 'gWkcW_]YfYbXYg'DchYbn]U`ini f'GdU`hi b[Yf_YbbYb"'8Yf'6fYa Yf'@UbXYgj cfg]hnYbXY'7\f]ghcd\'GdY\f'Vf]b[h Yg'Ui Z'XYb'Di b_h' 5``Ygž'k Ug']b'X]YgYf'5i gY]bUbXYfgYhni b[[YgU[h'k]fXž_Ubb'ZU`gWk'j YfghUbXYb'k YfXYb" '8]YgY'Yl d`cg]j Y H\Ya Uh]_']gh'b]Wkh'bi f'dc`]h]gWk'\Y]» ž'g]Y'VYhf]ZZh'Ui Wk
<ibXYfhhUi gYbXYž'X]Y'hÀ[`]Wk'i bhYf'XYb'5i gk]f_i b[Yb'XYf?cbZ]_hY'Y]XYb"

9]bY _ca d`]n]YfhY 5i gY]bUbXYfgYhni b[

± XYf'U_hi Y``Yb'G]hi Uh]cb'k]fX'XYi h`]WXž'XUgg'X]Y'A]h[`]YXgWXUZh XYf'@]b_Yb'g]WX'k UbXY`h"'8Yf'9]bZi gg'a][fUbh]gWXYf'DYfgdY_h]j Yb]gh']b'XYb'i fVUbYb'NYbhfYb'ghUf_'[Yk UWXgYb"'8]YgY'9bhk]W_`i b[gc``hY'X]Y'; YgdfÀWXg_i `hi f'dfÀ[Yb/XcWX'ghUhhXYggYb'k]fX'X]Y HfYbbi b['nk]gWXYb'5bh]gYa]h]ga i g'i bX'BU\cgh!?cbZ]_h ni bY\a YbX'ni f'U_UXYa]gWXYb'8YVUhhYž'k À\fYbX'X]Y'FYU`]hÀh XYf'?Àa dZY'hÀ[`]WX'bYi Y'8YVUhhYb'Ui g`Ògh"

8 Yf Ni gUa a YbVfi W. 'nY][h'g]W. ']b 'XYf'² ZZYbh`]W._Y]h '8]Y a YX]U`Yb '6Yf]W.hYfghUhhi b['ØVYf'X]Y '@]b_Y ']gh'U``Yg 'UbXYfY'U`g k c\`k c``YbX"'A]h'Y]bYf 'Gh]a a i b[gk YbXYž'X]Y 'Ub'Y]bYb XfUa Uh]gW.Yb 'GcUd!CdYfU'Yf]bbYfhž'k]fX 'XUg'H\Ya U'ni f' @ gh Ua 'I bhYf[Ub["'9g']gh'U`Ufa]YfYbXž'XUgg'X]Y '@]b_Y'g]W. ']b 'Y]bYa A ca Ybhž']b 'XYa 'k]W.h][Y'; fi bX`U[Yb 'ZØf'X]Y '6i bXYghU[gk U\`[Y`Y[h'k YfXYb 'gc``hYbž']b 'X]YgYf'XYgc`UhYb '@U[Y'k]YXYfZ]bXYh" : fU[Yb 'V`Y]VYb'i bVYUbhk cfhYh 'K]Y'_Ubb'g]W. 'X]Y 'DUfhY]'Ui g X]YgYa '9`YbX'VYZfY]Yb3

=a GWN UhhYb XYg K U\`_Ua d Zg

 $8]Y ?? f]gY gWX Y]bh'X]Y @]b_Y]b Y]bY 9W_Y ni `XfÅb[Ybž'Ui g'XYf'Yg _Ui a `Y]bYb 5i gk Y[`[]Vh'' 5_hi Y```g]bX g]Y `Ui Z'XYf'Gi WXY bUWX Y]bYf' < Ui ghØf_Ua dU[bYž'i a `nYbhfU`Y'K U\`_Ua dZh\Ya Yb'ni$

 $\label{thm:complex} $$ [XYbh]Z]n]YfYb" 8 cW. k]Y'j]Y'Y'HØfYb XUfZ'X]Y'6Ug]g'Yhnh $$ hUhgAW.]W. Ub_`cdZYbž'i a `XYb'Øb[ghYb'=a U[YgW.UXYb'ni fYdUf]YfYb3'8Yf'_ca a i b]n]YfhY'K]``Y'ni f'FYZcfa '_ObbhY'g]W. 'U`g hfØ[Yf]gW.`YfUi gghY``Ybž'gc`Ub[Y'[fi bX`Y[YbXY': fU[YbkY]hYf\]b']a `FUi a 'ghY\Yb"$

9g'VfUi Wkh'Xf]b[YbX'@Ògi b[Yb°'9]b'@]WkhV`]W_'gWkY]bh'ZYfbž'i bX XYf'K Y['k]fX'ghY]b]['gY]b"'8]Y'@]b_Y'a i gg'Yf_YbbYbž'XUgg'g]Y g]Wk'gY`Vgh'fYhhYb'a i gg''gcbgh'V`Y]Vh'g]Y']a 'GWkUhhYb'XYf UbXYfYb'DUfhY]Yb'ni f@W_"'8]Y': fcbhYb'XYf'8YVUhhY'g]bX j Yf\ÀfhYhž'i bX'VU'X'_ÒbbhY'XYf'8fi W_'Ui g'XYb ; YgY``gWkUZhggWk]WkhYb'XUni 'Z@\fYbž'XUgg'X]Y'@]b_Y'Y]ba U``a Y\f]bg'dc`]h]gWkY'JYf[YggYb'fi hgWkh"'K Yf'\ÀhhY'[YXUWkhž'XUgg'XYf dc`]h]gWkY'GWkUXYb'bUWk'Y]bYa 'VY`YVYbXYb'DUfhY]hU['gc_UhUghfcd\U`'gY]b'_ÒbbhY3

 $5 ``X]Yg'dUgg]Yfh'j cf'XYa '<]bhYf[fi bXž'XUgg'j]Y`Y'DUfhY]Yb'U_hi Y``a]h'XYb'5i gk]f_i b[Yb'[`cVU`Yf'?f]gYb'ni '_Aa dZYb'\UVYb'''8cW\b]f[YbXk c'k]fX'X]Y'5i gY]bUbXYfgYhni b['gc'\]hn]['[YZØ\fh'k]Y']b XYf'@]b_gdUfhY]^'8Yf'FØW_\U`h']gh'XØbbž'X]Y'A YX]YbhU_h]_Yb [YZA\f']W\ž'i bX'X]Y': fU[Y'V`Y]Vh'<Uh'8]Y'@]b_Yž'X]Y'g]W\'Y]bgh ghc`n'U`g'Gh]a a Y'XYf'I bhYfXfØW_hYb'j YfghUbXž'XUg'DchYbh]U`ž X]YgY'?f]gY'ni 'ØVYfghY\Yb3$

8 Y hU]`g