

8 Y f '8 fi W_ 'Ui Z 'GhUV `Y Wc]b 'ghY][hž 'X Ug i fgdfØb[`]WX Y 'J Y fgdfY WX Y b 'Y]b ni `ÒgY b

5 `g `GhUV`Y Wc]bg `]b `XYf? fmd hck Y`h'Ui ZhUi Wk hYbž'k i fXYb `g]Y U`g `5bhk cfh'Ui Z'X]Y `]b\ÀfYbhY `J c`Uh]`]hÀh'j]Y`Yf'X][]hU`Yf 5ggYhg `Ub[Ydf]YgYb" 8]Y `a Y]ghYb `GhUV`Y Wc]bg'k ØfXYb `Xi fWk\UfhY `J Yfa O[Ybgk YfhY'k]Y Y]bY'K À\fi b[`[YXYW_hž'X]Y]\fYb `K Yfh'j YfUb_Yfb" 6Y] Y]b][Yb `GhUV`Y Wc]bg'\Uh'Yg cZZYbg]Wk h`]Wk `b]Wk h`[Ubn `gc `[Y_`Udd hž'XU'Y]b `gY\f dfca]bYbhYf'Hc_Yb `bUa Ybg'HYffUI G8 `Ui Z'gdY_hU_i `ÀfY K Y]gY `]a d`cX]YfhY i bX'Y]b `UbXYfYfž'HYh\Yfž'a]h Ub\U`hYbXYb : fU[Yb `ØVYf'gY]bY `J Yfa O[Ybgg]Wk Yfi b[_cbZfcbh]Yfh']gh" `A Ub `a i gg `ZU]fYfk Y]gY `gU[Ybž'XUgg `XUg J YfhfUi Yb `]b `XYb `GY_hcf'b]Wk h`\cW `]ghž'k cVY] Y]b][Y ?f]h]_Yf'gc[Uf']b : fU[Y`ghY``Ybž'cV`GhUV`YWc]bg'YI]gh]YfYb gc``hYb" 8]Y `?fmd hc]bXi ghf]Y`ghY\h'bi b`i bhYf`XYa `8 fi W_'j cb ; Yf]Wk hYbž'5i Zq]Wk hgVY\OfXYb '/ Ua d\Y``]d/

5`g`GhUV`YWc]bg`]b`XYf`?fmdhckY`h`UiZhUiWkhYbž`kifXYb`g]Y`U`g 5bhkcfh`UiZ`X]Y`]b\ÀfYbhY`Jc`Uh]`]hÀh`j]Y`Yf`X][]hU`Yf`5ggYhg Ub[Ydf]YgYb"`8]Y`aY]ghYb`GhUV`YWc]bg`kØfXYb`XifWk`\UfhY JYfaÒ[YbgkYfhY`k]Y`Y]bY`KÀ\fib[`[YXYW_hž`X]Y`]\fYb`KYfh jYfUb_Yfb"

6Y]'Y]b][Yb'GhUV`YWc]bg'\Uh'Yg'cZZYbg]W\h`]W\'b]W\h'[Ubn'gc [Y_`Uddhž'XU'Y]b'gY\f'dfca]bYbhYf'Hc_Yb'bUaYbg'HYffUlG8'UiZgdY_hU_i`ÀfY'KY]gY']ad`cX]YfhY'ibX'Y]b'UbXYfYfž'HYh\Yfž'a]hUb\U`hYbXYb':fU[Yb'ØVYf'gY]bY'JYfaÒ[Ybgg]W\Yfib[cbZfcbh]Yfh']qh''

A Ub 'a i gg 'ZU]fYfk Y]gY 'gU[Ybž'XUgg 'XUg'J YfhfUi Yb ']b 'XYb 'GY_hcfb]W\h'\cW\']ghž'k cVY]'Y]b][Y '? f]h]_Yf'gc[Uf']b ': fU[Y 'ghY ``Ybž'cV GhUV`YWc]bg 'YI]gh]YfYb 'gc ``hYb"

8]Y ?fmdhc]bXi ghf]Y ghY\h'bi b'i bhYf'XYa '8fi W_'j cb'; Yf]W\hYbž 5i Zg]W\hgVY\ÒfXYb'i bX'; YgYhn[YVYfbž'hfUbgdUfYbhYf'ni 'nY][Ybž XUgg'g]Y 'XUg'i fgdfØb[`]W\Y'J YfgdfYW\Yb'j cb'GhUV`YWc]bg'a]h ZYghYf'J Yfa Ò[Ybgg]W\Yfi b['Y]b\À`h"

; Ufm; Ybg`Yfž'XYf'Jcfg]hnYbXY'XYf'GYW'f]h]Yg'UbX'9I WXUb[Y
7ca a]gg]cbž'k]YXYf\c`hY'X]YgYb'AcbUh'Y]bY': cfXYfi b[ž'XUgg
GhUV`YWc]bg'a Y\f'FY[i`]Yfi b['VYbOh][Ybž'i bX'gU[hYž'Yf'k YfXY
a]h'XYa'?cb[fYgg'ni gUa a YbUfVY]hYbž'i a 'g]Y'ni 'Ybhk]W_Y`b"
I bX']b'Y]bYa'i ba]hhY`VUfYfYb'GWXf]hh'\Uh'Y]b'BYk'Mcf_Yf'; Yf]WXh
X]YgY'K cWXY'XYa'?fmdhc]bXi ghf]Y!;][UbhYb'HYh\Yf'Y]bYb'GWX`U[
j YfgYhnhž'k Y]`'Yf'\DZcfa Uh]cbYb'\OVYf'X]Y'FYgYfj Yb'c\ZZYb[Y`Y[h

8 Yf'l G8 H!Hc_Yb'j cb'HYh\Yf'k]fX'Ui Z'XYb'A Àf_hYb'ZØf?fmdhck À\fi b[Yb'\Ài Z]['ZØf'XYb'< UbXY`'a]h'6]hWc]b'i bX'UbXYfYb k]W\h][Yb'X][]hU`Yb'J Yfa Ò[Ybgk YfhYb'j Yfk YbXYh'''9g']gh'X]Y [fÒ» hY']a 'l a `Ui Z'VYZ]bX`]W\Y'GhUV`YWc]b'a]h'Y]bYa 'A Uf_hk Yfh j cb'fi bX'+\$'A]``]UfXYb'8c``Uf'''9g'[UV'YXcW\'gY]h'`Ub[Ya ': fU[Yb ni f'E i U`]hÀh'XYf'5Vg]W\Yfi b['j cb'J Yfa Ò[Ybgk YfhYb'''5bghUhh Y]bY'Zcfa Y``Y'DfØZ b['gY]bYf'JYfa Ò[Ybgk YfhY'ni j YfÒZZYbh`]W\Ybž'ghY``h'HYh\Yf'6YgW\Y]b][i b[Yb'ØVYf'XYfYb'K Yfh VYfY]h''

=a '≯J\f'&\$&%'nU\`hYb'gck c\``HYh\Yf'U`g'Ui W\'X]Y'GW\k YghYf!
?fmd hcVÒfgY'6]hZ]bYI'Y]bY'GhfUZY']b'<Ò\Y'j cb'%, ž) 'A]``]cbYb
8 c``Ufž'bUW\XYa 'XYf'BYk 'Mcf_Yf'; YbYfU`ghUUhgUbk U`h'g]Y
VYgW\i`X][h'\UhhYž' a Ugg]j Y 'Z]bUbn]Y``Y'J Yf`i ghY'ni 'j Yfhi gW\Yb"
8]Y'6Y\Ui dhi b['j cb'HYh\Yfž'XUgg'gY]bY'j]fhi Y``Y'K À\fi b[
'YXYfnY]h'j c``ghÀbX]['Xi fW\'I G!8 c``Uf'[YXYW_h'k Ufž'k Uf'Y]bY
@Ø[Y ž'gU[hY'@Yh]h]U'≯Ja Yg'XUa U`g"'HYh\Yf'i bX'6]hZ]bYI'[UVYb
_Y]b': Y\`j Yf\U`hYb 'ni "'

8 UgʻBYkʻMcf_Yfʻ; Yf]WX hgi fhY]``\Y]nh'XYa'I bhYfbY\a YbʻYfbYi h Ui Zʻʻ±bʻY]bYfʻ?`U[Yž'X]Yʻ]aʻ¾ b]ʻ&\$%- 'VY]a'I G!6Yn]f_g[Yf]WX h'ZØf XYbʻgØX`]WXYbʻ6Yn]f_ʻj cbʻBYkʻMcf_ʻY]b[YfY]WX h'k i fXYž'K]fX VY\Ui dhYhžʻHYh\Yfʻi bXʻ6]hZ]bYIʻ\ÀhhYbʻZU`gWXYʻ±bZcfa Uh]cbYb ØVYfʻX]YʻHYh\Yf!GhUV`YWc]bʻUi g[YhUi gWX h'i bXʻg]WXʻUb $A \ Uf_ha \ Ub]di \ `Uh]cb \ `VYhY]`][\ h" \ HYh\ Yf \ `Uh \ XYb \ : \ U```U`g'i \ bVY[\ fØbXYh \ VYnY]W \ bYh"$

8]YgY'K cW\Y'VYZU\``F]W\hYf]b'?Uh\Yf]bY'Dc`_': U]``U'HYh\Yf'i bX 6]hZ]bYI ž'±bZcfa Uh]cbYb']a '9]b_`Ub['a]h'XYb': cfXYfi b[Yb'XYf ?`À[Yf'j cfni `Y[Ybž'i bX'VYgW\f]YV'X]YgY'8c_i a YbhY'U`g nk Y]ZY``cg'k]W\h][ž'XU'g]Y'g]W\'Ui Z'X]Y'I bhYfghØhni b['j cb'HYh\Yf! i bX'?fmdhc!Fc\ghcZZhfUbgU_h]cbYb'VYn]Y\Yb "'

9]b; Yf]W\h'\Uh'Yhnh'UV[Ykc[Yb'ibX'[YgU[hž:XUgg'G]Y'X]YgY 8c_iaYbhY'\YfUig[YVYb'aØggYbžia'ni'VYkY]gYbž'XUgg'G]Y'gc ibhYfghØhnh'kifXYbž'k]Y'G]Y'gU[hYbž'XUgg'G]Y'Yg'kUfYb"'9g']gh _Y]b'6]hhY'aY\fž'Yg']ghž'XUgg'G]Y'_Y]bY'KU\``\UVYb ž'gU[hY 7\Uf`Ym'7ccdYfž'79C'XYf'6`cW_W\U]b!:]faU'F'"'

6]hZ]bYI `Y\bhY Yg `UVžg]W\ `ni `XYa ; Yf]W\ hgi fhY]``ni `Ài » Yfb"

HYh\Yf `gU[hYž XUg ; Yf]W\ hgi fhY]` `gY] `Y]bY `fci h]bYa À»][Y

9fa]hh`i b[gUbcfXbi b[`i bX `i bhYfa Ui YfY `]b `_Y]bYf `K Y]gY `X]Y

i bVY[fØbXYhYb `6Y\Ui dhi b[Yb `XYf `? `À[Yf " '8 Ug `I bhYfbY\a Yb

ZØ[hY `\]bni ž Yg `\ UVY `VYfY]hg `ni [Ygh]a a hž 8 c_i a YbhY

j cfni `Y[Ybž X]Y `Ui gfY]W\ Ybž `i a `X]Y `F YgYfj Yb `ni f `I bhYfghØhni b[
j cb `I G8 H `ni `Yfa]hhY `bž `i bX `X]YgYf `GhfY]h `VYhfUZ `YX][`]W\ `XYb

I a ZUb[`XYf 'j cfni `Y[YbXYb `8 c_i a YbhY "

=a '5i [i gh'gU[hY'HYh\Yfž'Yg'k YfXY'g]W\'XUfUi Z'_cbnYbhf]YfYbž 6YgW\Y]b][i b[Yb'j cb'j]YfhY`'À\f`]W\'Ui Z'a cbUh`]W\'ni j YfÒZZYbh`]W\Yb'i bX'a]h'XYf'K]fhgW\UZhgdfØZi b[g[YgY``gW\UZh 68 C' ≠\U`]U'ni gUa a Ybni UfVY]hYb"'8]Y':]fa U'gU[hY'Ui W\ž'X]Yg'gY] XYf' bÀW\ghY'GW\f]hh'Ui Z'XYa 'K Y['XYg'I bhYfbY\a Ybg'ni 'Y]bYf j c``ghÀbX][Yb'DfØZi b["'

± XYf Nk]gW YbnY]h ZÀ``h X]Y '9b hgW Y]Xi b[XYg'; Yf]W hg Ui W 'ni Y]bYa 'NY]hdi b_hž Ub XYa 'XYf'?cb[fYggUV[YcfXbYhY DUhf]W_ A W Ybfm fF B "7" Ł i b X X]Y '? cb[fYggUV[YcfXbYhY A UI]bY K UhYfg fB!75 Ł ž X]Y 'U `g'J cfg]hnYb XY 'XYg' < ci gY '7 ca a]hhYY 'cb':]bUb W]U` GYfj]W g Z b[]Yfh ž ØVYf Y]bYb 'GhUV `Y W c]b! F Y W bi b[gYbhk i fZ i Yf\Ub XY`b"

@Ui h'Y]bYf?cd]Y'XYg'; YgYhnYgYbhk i fZgžXYf'XYf':]bUbW]U``H]a Yg cf[Y`Y[h'k i fXYž'k ØfXYb'X]Y'5i Zg]WkhgVY\ÒfXYb'X]Y': A\][_Y]h Y]bYg'9a]hhYbhYb'dfØZYbž'FYgYfj Yb'ZØf'Hc_Yb'Ui Z'a]bXYghYbg Y]bYf'9]bg!ni !9]bg!6Ug]g 'VY]'YXYa '5bhfU['Ui Z'6Yhf]YV']b'XYb I G5'ni '\U`hYb''I bX'FYgYfj Yb'a ØgghYb'JYfa Ò[Ybgk YfhY'k]Y'I G! K A\fi b[z'GWk Uhnk YWkgY`z'DYbg]cbg[YgWkAZhY'i bX FYgYfj YY]b`U[Yb'XYf'NYbhfU`VUb_'i a ZUggYb''GhUV`YWc]bgz'X]Y Xi fWk'7cXY'i bX'5`[cf]h\a Yb'i bhYfghØhnh'k YfXYb''A\b`]Wk'k]Y X]Y'Yhnh'VYfØWkh][hY'HYffU!GhUV`YWc]bz'X]Y']a d`cX]YfhY'' k ØfXYb]b'XYf'?A`hY'`]Y[Yb''

8]Ygʻgd]Y[Y`h'X]Yʻk Y]h'j YfVfY]hYhYʻ5bg]W\h'i bhYf
5i Zg]W\hgVY\ÒfXYbʻi bXʻ; YgYhn[YVYfbʻk]XYfž'XUggʻYgʻ]bʻX]YgYa
GY_hcfʻni ʻj]Y`YʻF]g]_Ybʻ[]Vh'i bXʻa Ubʻg]W\b]W\h'XUfUi Zʻj Yf`UggYb
gc``hYž'XUggʻg]W\'XYfʻGY_hcfʻgY`VghʻfY[i`]Yfh žʻgU[hYʻ7\Uf`]Y
GhYY`Yž'Y\Ya U`][Yfʻ5bk U`h'XYfʻI G!FY[]Yfi b['i bX'Yhnh'DUfhbYf
VY]': cfYbg]WF]g_ʻ5``]UbWYž'Y]bY`FY[i`]Yfi b[gVYfUhi b["

DYfgcbYbž'X]Y'a]h'XYa '9bhk i fZ'j YfhfUi h'g]bXž'gU[Ybž'XUgg'Yg i bk U\fgW\Y]b`]W\']ghž'XUgg'XYf'; YgYhnYbhk i fZ'X]YgYg'\J\f'; YgYhn k]fXž'k cVY]'Y]bY'DYfgcb'j cfgW\`À[hž'XUgg'X]Yg'\O\YfY'; Yk U`h YfZcfXYfb'k ØfXY"'8Yf'9bhk i fZ'gc``'YXcW\'5i ZgW\`i gg'XUfØVYf [YVYbž'k]Y'XYf'\%, "'?cb[fYgg' 'XYf']a 'Bcj Ya VYf'[Yk À\`h k YfXYb'gc`` 'Ub'X]Y'GhUV`YWc]b!FY[i `]Yfi b['\YfUb[Y\h"

5 b g h U h h b U W X Y b 'A] X h Y fa g 'b Y i 'U b n i Z U b [Y b ž 'g] b X 'k] f 'g W c b] f [Y b X k c '] a 'G d] Y `" '9 g '] g h '] b g c Z Y f b 'Y f b g h ž 'U `g 'Y g 'b À W g h Y g '\lambda \rangle f \text{U} \cdot g '\text{V} b 'X g U [h '7 c c d Y f "

gWchh"WX]dc`]bU4 Zh"Wca

EiY``Y.:]bUbW]U``H]a Yg

6 Ygi WX Yb 'G]Y 'i bg 'Ui Z. '_fmd hc!b Yk g"Uh