

7i fj Y'GhUV`YWc]b']gh'hfchn'VY\ÒfX`]WXYf DfØZi b[']b'5fVY]h

8 Y f 7 9 C j cb 7 i fj Y ž A] W U Y ` 9 [cfc j ž g U [h Y ž X U g $I bhYfbY\a Yb ghfYVY X]Y 9]bZØ\fi b[Y]bYfY][YbYb$ GhUV`YWc]b'Ub', VYfVYg]W\YfhY'GhUV`YWc]bg'j YfZØ[Yb'ØVYf FYgYfj Yb'Ub'?fmdhck À\fi b[ghc_Yb'cXYf'UbXYfYb JYfa Ò[Ybqk YfhYbž'X]Y'X]Y'5bnU\`XYf'Ui q[Y[YVYbYb GhUV`YWc]bg'ØVYfghY][Ybž'k Ug'h\YcfYh]gW\'Y]bYb'Di ZZYf [Y[Yb'DfY]qqWk Ub_i b[Yb'XUfqhY``h'6\OfqYb`]ei]X]h\Ahqdcc` 7 i fj Y'k]```gY]bYb'YfghYb'bUh]j Yb'GhUV`YWc]b'Ui Z'XYb'A Uf h Vf]b[Yb'i bX'g]W\'XUa]h'Y]bYf'FY]\Y'j cb']bgh]hi h]cbY``Yb A Uf_hhY]`bY\a Yfb'UbgW\`]Y»Ybž'X]Y'bUW\'XYf''Øb[ghYbž d`Ohn`]WXYbii bXigdY_hU_i `AfYbi9I d`cg]cbij cbiHYffUgil GH! GhUV`YWc]bia AUf_hUbhY]`YkYhhY]ZYfb"8Yf ; $YqWAAZhqZØ\fYfXYf$:]fa UžA]WXUY``9[cfcjž]b`U'j]fhi Y``Yf 5i Zhf]hh:8cbbYfghU['gU[hYž'XUgg'X]Y 'GhUV`YWc]b ØVYfVYg]WXYfh'gY]b'gc``"'HYffUI G8' 'XYggYb'=a d`cg]cb'X]Y $A \hat{A}f_hY Z \emptyset f X][]hU Y / Ua d \wedge Y)]d /$

- 8Yf'79C'jcb'7ifjYž'A]W\UY`'9[cfcjž'gU[hYž'XUg IbhYfbY\aYb'ghfYVY'X]Y'9]bZØ\fib['Y]bYf'Y][YbYb GhUV`YWc]b'Ub
- VYfVYg]WXYfhY'GhUV'YWc]bg'j YfZØ[Yb'ØVYf'FYgYfj Yb'Ub ?fmdhck À\fi b[ghc_Yb'cXYf'UbXYfYb'JYfa Ò[Ybgk YfhYbž X]Y'X]Y'5bnU\'XYf'Ui g[Y[YVYbYb'GhUV'YWc]bg ØVYfghY][Ybž'k Ug'h\YcfYh]gWX'Y]bYb'Di ZZYf'[Y[Yb DfY]ggWXk Ub_i b[Yb'XUfghY'`h

6 OfgYb`]ei]X]hÀhgdcc`.7i fj Y'k]``gY]bYb'YfghYb'bUh]j Yb'GhUV`YWc]bUi Z'XYb'A Uf_h'Vf]b[Yb'i bX'g]W\'XUa]h'Y]bYf'FY]\Y'j cb]bgh]hi h]cbY``Yb'A Uf_hhY]`bY\a Yfb'UbgW\`]Y» Ybž'X]Y'bUW\'XYf
Øb[ghYbž'd`Ohn`]W\Yb'i bX'gdY_hU_i `AfYb'9I d`cg]cb'j cb'HYffUg I GH!GhUV`YWc]b'i a 'A Uf_hUbhY]`Y'k YhhY]ZYfb''

8 Yf; YgWX À ZhgZØ\fYf'XYf':]fa Už'A]WXUY``9[cfcjž']b'U'j]fhi Y``Yf
5 i Zhf]hh'8 cbbYfghU['gU[hYž'XUgg'X]Y'GhUV`YWc]b'ØVYfVYg]WXYfh
gY]b'gc``"'HYffUI G8' 'XYggYb'=a d`cg]cb'X]Y'A Àf_hY'ZØf'X][]hU`Y
J Yfa Ò[Ybgk YfhY']b'Y]bYa '5 i ga U» ']b'X]Y'<Ò\Y'[Yhf]YVYb'\Uhž']b
XYa 'g]WX'j]Y`Y'<ÀbX`Yf'bcWX'b]WXhj c``ghÀbX]['Yf\c`h'\UVYb' ']gh
hY]`k Y]gY'i bhYf'6YgWXi gg'[YfUhYbž'k Y]`'Yg'b]WXh'[YbØ[YbX
G]WXYf\Y]hYb'j cf\À`hž'i a 'gY]bY'9]bg!ni!9]bg!6]bXi b['Ub'XYb'I G!
8 c``Uf'Ui ZfYWXhni Yf\U`hYb'"'

8 Ugʻ]ghʻU``Ygžk Ugʻ]W\ʻ]a ʻA ca YbhʻgU[Ybʻ_Ubb žʻgU[hYʻ9[cfcjžc\bY`Y]bʻGhUfhXUhi a ʻUbni [YVYb"

, VYfVYg]WXYfhY GhUV YWc]bg j YfZØ[Yb ØVYf F YgYfj Yb Ub
?fmd hc k À\fi b[ghc_Yb c XYf Ub XYfYb J Yfa Ò[Ybgk YfhYbž X]Y X]Y
5bnU\ `XYf Ui g[Y[YVYbYb GhUV YWc]bg ØVYfghY][Ybž k Ug
h\ YcfYh]gWX Y]bYb Di ZZYf [Y[Yb DfY]ggWX k Ub_i b[Yb XUfghY ``h" 9g
]gh Y]b `A\b`]WXYf 5i ZVUi k]Y Ui Z 6]hWc]b ``Ui hYbXY ? fYX]hYž VY]

XYbYb'XYf'GW\i`XbYf'a Y]ghYbg'k Y]h'a Y\f'j cb'XYf ?fmdhck À\fi b['Ui ZVf]b[Yb'a i ggž'U`g'h\YcfYh]gW\'ni f'8YW_i b[XYf'VYhfYZZYbXYb'?fYX]h`]b]Y'VYbÒh][h'k]fX"

9[cfcj []b[b]Wkhili ZVYgh]a a hYiJ Yfa Ò[Ybgk YfhYiY]bžiX]Yili`g FYgYfj YbiZØfiXUgibYi YiDfcXi _hiX]YbYbigc``Yb"'GhUV`YWc]bg k YfXYbi]biXYffFY[YiiXi fWkiXYbi8c``UfžiXYbi9i fcicXYfiUbXYfY `]ei]XYii bXi[Àb[][Yii]Uh!K À\fi b[Ybi[YXYW_h"i5bXYfY GhUV`YWc]bgžiY]bgWk`]Y»`]WkiHYh\Yfžik i fXYbik Y[Ybia Ub[Y`bXYf HfUbgdUfYbnii bXiXYfi5i gg]WkhžiGhUV`YWc]b!; Y`XYfij cbi?i bXYbi]bfY`Uh]jii]``]ei]XYiJ Yfa Ò[Ybgk YfhYiniii]bj Ygh]YfYbžiY]bYfi[YbUi YbDfØZ b[ii bhYfnc[Yb"i

8 Yf'[Yd`UbhY'GhUfh'YfZc`[hžXU'X]Y'5i Zg]WkhgVY\ÒfXYb'k Y`hk Y]h' j]Y``Y]Wkh'Ua 'VYa Yf_Ybgk YfhYghYb'X]Y'I G!:]bUbna]b]ghYf]b'*JbYh MY``Ybž'X]Y'Y]bY'ghfYb[Y', VYfk UWki b['j cb'GhUV`YWc]bg'À\b`]Wk k]Y'VY]: 8 =7!j Yfg]WkYfhYb'6Ub_Yb'[YZcfXYfh'\Uh' 'X]Y'DfcnYggY ZØf'X]Y'GhUV`YWc]b!FY[Y`i b['bUWk'XYa 'Ni gUa a YbVfi Wk'j cb HYffUI G8'j YfghÀf_Yb"'

I GH'k i fXY'j cb'@ B5'VYg]W\Yfhž'k Ug'`YhnhYbX`]W\'j ca '9fZc`[j cb'l GH'UV\Àb[h ž'gU[hY'9[cfcj"' 8Ug'\Uh'l GH'XYf'HcXYggd]fU`Y Ui g[YgYhnh" '

8]Y \Rightarrow hY fb Uh]c b U`Y \cdot C f[Ub]gUh]c b \cdot XY f
K Y fhd Ud]Y fUi Zg]W hg VY \ Ò f XY b \cdot f \rightleftharpoons G7 C \models i b X \cdot XY f \cdot 5 i gg W i gg \cdot ZØ f
NU\`i b[Yb \cdot i b X \cdot A Uf_h]b Zf Ughf i _hi fY b \cdot XY f \cdot 6 Ub_ \cdot ZØ f \Rightarrow hY fb Uh]c b U`Y b \cdot NU\`i b[gUi g[`Y]W \cdot f7 DA \Rightarrow `\ UVY b \cdot 5 b ZUb[\cdot X]Y gY g
A c b Uhg \cdot]\fY j c fY fgh \cdot Yb X[Ø h][Yb \cdot @Y]h \]b]Y b \cdot ni \cdot XY b \cdot VY ghY b
GhUV `Y Wc]b! DfU_h]_Y b \cdot \Yf Ui g[Y[YVY b" \cdot

8]Y''Øb[ghYb'A Uf_hghÒfi b[Yb'k UfYb'nk Uf'ZØf'j]Y`Y'_cghgd]Y`][ž UVYf'_Y]bY'gmghYa VYX]b[hYb'9fY][b]ggY ž'gU[hY'xb'7i b`]ZZYž Jcfg]hnYbXYf'XYg'7DA =i bX'ghY``j YfhfYhYbXYf'; ci j YfbYi f'ZØf :]bUbnghUV]`]hÀh'VY]'XYf'6Ub_'cZ'9b[`UbXž']b'U'5i ggU[Yk Ug'g]W j Yfa i h`]W\'Ui Z'X]Y'8YdY['jcb'l GH']a 'A U]'VYn]Y\h"

 $K Ybb Y]bY GhUV YWc]b U g A YWW Ub]ga i g ni f \ VYfhfU[i b[\ j cb]$

; Y`Xk YfhYb`X]Ybh` i bX`ZØf`X]Y`:]bUbna Àf_hY`U`g
gmghYa fY`Yj Ubh i[]`h` ia i gg`g]Y`bUW\5bg]W\h'XYf`6=\Y]bY`FY]\Y
VYgh]a a hYf`]bhYfbUh]cbU`Yf`GhUbXUfXg`Y]b\U`hYbž`X]Y`]a iNi [Y`XYf
[`cVU`Yb`:]bUbn_f]gY`Y]b[YZØ\fh`k i fXYb`?f]gY`&\$\$, "

5i Zg]Wk hgVY\ OfXYb ']b 'XYb 'I G5 'gU[Ybž'XUgg'g]Y 'VYgcbXYfg VYgcf[h'g]bXž'k Ybb 'Yg'i a 'HfUbgdUfYbn'i bX'F]Wk h`]b]Yb ']b '6Yni [Ui Z'GhUV `YWc]b!FYgYfj Yb '[Y\ h" K Ybb 'G]Y 'g]Wk 'bi f'X]Y '9fY][b]ggY]a '5df]`'i bX'A U] 'UbgY\Ybž'`Ui hYhY']a '; fi bXY'X]Y :: fU[Yž'X]Y 'g]Wk U``Y 'ghY``hYb.' K Ug'g]bX'X]YgY 'GhUV `YWc]bg3'G]bX'g]Y 'k]f_`]Wk ghUV]`3'K Ug'gdf]Wk h'XUZØf3 ž'gU[hY'K c`Z[Ub['6UfXcfZž'GYb]cf'J]Wk DfYg]XYbh'i bX'; fci d'HfYUgi fYf'j cb'7\YW_ci h"Wca ž'k À\fYbX Y]bYg'_Øfn`]Wk Yb'6`cW_k cf_g!K YV]bUfg"

п + п

 $8 \ Y \ f' \ 6 \ Y' \ hf \ U[\ '7i \ fj \ Y' \ Gh \ UV \ YWc] \ b' = g'] \ b' \ h \ Y' \ K \ cf \ g \ 2 \ hf \ hn' \ VY \ Of \ X`] \ WX \ Yf \ Df \ \emptyset \ Z \ b[\ '] \ gh' \ Y' \ b' \ Y' \ 6 \ Yf \ Uhi \ b[\ ''] \$

8 YhU]`q

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