

6f]h]gWX Yg J YfhY]X][i b[ga]b]ghYf]i a ghUfhYh =bbcj Uh]cbgcZZYbg]j Y a]h (\$\$ A]c " DZi bX °

8 UgʻJ YfY]b][hYʻ? Òb][fY]WXʻdfÀgYbh]Yfh`X]Yʻ8 YZYbWY *bcj Uh]cbži a 'hYWXbc`c[]gWXY': cfhgWXf]hhY`]b`XYf J YfhY]X][i b['V]q`&\$&) 'ni 'VYqWX 'Yi b][Yb"



JYfY]b][hYg? Ob][fY]WX ! = NY]hU`hYf`ghÀbX][Yf`hYW\b]gW\Yf
9bhk]W_`i b[Yb`\Uh`XUg`JYfY]b][hY? Ob][fY]WX Y]bYb`k]WXh][Yb
GW\f]hh`]b`F]W\hi b[`a cXYfbYf`JYfhY]X][i b[gghfUhY[]Yb
i bhYfbca a Yb"'<Yi hYž`Ua '&"'**`]`&\$&) ž`k i fXY`X]Y`8YZYbW\

*bcj Uh]cb`fl ?8 *\]bg`@YVYb`[Yfi ZYbž`i a `X]Y`9bhk]W_`i b[`i bX
9]bZØ\fi b[`ZcfhgW\f]hh`]W\Yf`HYW\bc`c[]Yb`]b`XYf`a]`]hÀf]gW\Yb
*\DZfUghfi _hi f`ni `VYgW\`Yi b][Yb"'8]YgY`\D]h]Uh]j Y`\Uh`XUg`DchYbn]U`ž
XYb`Vf]h]gW\Yb`JYfhY]X][i b[ggY_hcf`[fi bX`Y[YbX`ni
hfUbgZcfa]YfYbž`k cVY]`Y]b`A\f`]W\Yg`6i X[Yh'j cb`a]bXYghYbg`(\$\$
A]``]cbYb`DZ bX`fYhk U`)(, `A]``]cbYb`l G!8c``Uf\L'ni f`JYfZØ[i b[
ghY\h"`@Ui h'H\Y`8YZYbgY`Dcgh`]gh'l ?8=XUg`\Dcj Uh]cbgnYbhfi a

XYg'JYfhY]X][ib[ga]b]ghYf]iag'ibX'gc```Y]bY'6fØW_Y'nk]gWXYbZcfhgWXf]hh`]WXYb'DfchchmdYb'ibX'XYf'GYf]YbdfcXi_h]cb'ZØfVf]h]gWXY'IbhYfbY\aYb'gWX`U[Yb"

JYfhY]X][ib[ga]b]ghYfræ\br<YU`YmžXYfX]Y; fØbXib[jcb1?8=Ub_ØbX][hYžVYhcbhYžk]Yk]Wkh][=bbcjUh]cbZØfX]YbUh]cbU`YG]WkYf\Y]hibXXUgKUWkghia XYfJYfhY]X][ib[g]bXighf]Y]gh"9fjYfkY]gh'UiZX]Y6Ygcf[b]gØVYfX]YKY`h`U[YibXXYbXf]b[YbXYb6YXUfZžX]Ya]`]hÀf]gWkYb: À\][_Y]hYbXYgJYfY]b][hYb?Òb][fY]WkgnijYfVyggYfb"<YU`YmVYaYf_hYžXUggX]Yr`UiZYbXYb6YaØ\ib[YbY]bYX]fY_hYFYU_h]cb'UiZX]Y@Y\fYb'UigXYaI_fU]bY!?cbZ]_hg]bXžiaX]YJYfhY]X][ib[gVYfY]hgWkUZhnighÀf_Yb'ibX'UiZbYiYfYb'U

8]Y'9W_dib_hY'XYf'bYiYb JYfhY]X][ib[gghfUhY[]Y

9]b'k YgYbh']WX Yf'6YghUbXhY]``X]YgYf'\bbcj Uh]cbgcZZYbg]j Y']gh'XYf GhfUhY[]W8 YZYbWY'FYj]Yk 'fG8 F \text{t}XYf']a 'j Yf[Ub[YbYb'A cbUh j YfÔZZYbh']WX h'k i fXY"'@Ui h'hYWXI?'i a ZUggh'XYf'G8 F '* & 9a dZY\`i b[Yb\end{tabular}X]Y'U``Y'j cb'XYf'FY[]Yfi b['U_nYdh]Yfh'k i fXYb" N]Y``]gh'Yg\end{tabular}XUgg'XUg'J YfY]b][hY'?\Ob][fY]WX'V]g'\&\s'\) 'Y]bY ZØ\fYbXY'hYWX bc`c[]Y[YghØhnhY'JYfhY]X][i b[gbUh]cb'k]fX"'8 Uni [Y\Offi'Ui WX'X]Y'9]bf]WX hi b['Y]bYg'7 mVYf!'i bX 9`Y_hfca U[bYh]gWXYb'?ca a UbXcg\end{tabular}XUg'i bhYf'XYa 'I?'GhfUhY[]W 7ca a UbX'cdYf]YfYb'gc``"'8]YgY'A U» bU\a Yb'g]bX'XUfUi Z Ui g[Yf]WX hYh\end{tabular}XYf \bXi ghf]Y'ni 'j YfVYggYfb'i bX'a]`]h\Af]gWXY'CdYfUh]cbYb'ni |bX'XYf \bXi ghf]Y'ni 'j YfVYggYfb'i bX'a]`]h\Af]gWXY'CdYfUh]cbYb'ni |bYY[fYfVb"

9]bY'nYbhfU`Y'Fc``Y'gd]Y`h'\]YfVY]'Ui W\'X]Y'9]bZØ\fi b['X][]hU`Yf A cXY``Yži a 'X]Y'9]bgUhnVYfY]hgW\UZh'XYg'A]`]hÀfg'ni 'cdh]a]YfYb" Gc'k]fX'i bhYf'UbXYfYa 'Y]b'8][]hU``HUf[Yh]b['K YV'a]h'Y]bYa 6i X[Yhj cb'%'A]``]UfXY'DZ bX'Ybhk] W_Y 'hž'XUg'V]g'&\$&+ VYhf]YVgVYfY]h'gY]b'gc``"'8]Y' \oplus hY[fUh]cb'j cb'?#9bhk] W_Y `i b[Yb k]fX'U`g'GW\'ØggY`ni f'JYfVYggYfi b['XYf'5V'Ài ZY'Ub[YgY\Yb" 5i W\'Y]b'JYfhY]X][i b[gk Y]hYb'7`ci X!8]Ybgh'a]h'G97F9H!GhUhi g gc```X]Y'9\Z]n]Ybn']b'XYf'JYfUfVY]hi b['_f]h]gW\Yf'8UhYb'ghY][Yfb"

HfYbXg]a JYfhY]X][ib[ggY_hcf

I a 'X]Y' < YfUi gZcfXYfi b[Yb'XYf'Ni _i bZh'ni 'a Y]ghYfbž'V`]W_h'X]Y

J YfhY]X][i b[g]bXi ghf]Y'Ui Z'a Y\fYfY' \(\delta \text{bcj Uh]cbghfYbXgž'X]Y'V]g

&\$&) 'Yfk UfhYh'k YfXYb"'9]bY'i a ZUggYbXY'5bU`mgY'nY][hž'XUgg

? Øbgh`]WXY' \(\delta \text{hY}``)[Ybn'i bX'5i hca Uh]g]Yfi b['Ub'j cfXYfghYf': fcbh
ghY\Yb"'A]`]h\(\delta f]gWXY'CdYfUh]cbYb'_\(\delta \text{bby} \delta \delta \text{bby} \delta fW '? \(\delta f)\delta hY'\)][YbW\(\delta f)\delta hY'\)][YbW\(\delta f)\delta fW \(\delta f)\delta fY \quad \delta f\delta f\del

Ni gàhn`]WX [Yk]bbh`XUgʻH\Ya Uʻ7 mVYfg]WXYf\Y]hʻ]a a Yfʻa Y\fʻUb 6YXYi hi b["'5i Z[fi bX`XYfʻk UWXgYbXYbʻ6YXfc\i b[Ybʻ]bʻXYf X][]hUʻYbʻK Y`hʻk]fXʻY]bYʻj Yfghàf_hYʻNi gUa a YbUfVY]hʻnk]gWXYb B5HCʻi bXʻXYa ʻDf]j UhgY_hcfʻ[YZcfXYfhžʻi a '_f]h]gWXY \div ZfUghfi _hi fYbʻni ʻgWX ØhnYb"'5i WXʻ9bhk]W_`i b[Ybʻk]YʻX]Y \div hY[fUh]cbʻj cbʻE i UbhYbj YfgWX`ØggY`i b['_ObbhYb`XUni VY]hfU[YbžX]YʻG]WXYf\Y]hʻYf\YV`]WX'ni ʻYf\O\Yb"

9]b'k Y]hYfYf'HfYbXž'XYf'b]W\h'i bVYUW\hYh'V`Y]VYb'gc``hYž'g]bX'X]Y6Ya Ø\i b[Yb'i a 'BUW\U`h][_Y]h']a 'J YfhY]X][i b[gVYfY]W\"'<]Yf`]Y[h'Y]b'GW\k Yfdi b_h'Ui Z'XYf'J Yfk YbXi b['\mVf]XYf'i bXYfbYi YfVUfYf'9bYf[]YgmghYa Y'gck]Y'Ui Z'XYf'9bhk]W_`i b[YbYf[]YYZZ]n]YbhYf'D`UhhZcfa Yb"

 $8]Y `c VYb `[Yb UbbhYb `HfYb Xg `g_]nn]YfYb `bi f `Y]bYb `HY]`` XYg `g]WX gWXbY```Ybhk]W_Y`bXYb `J YfhY]X][i b[ggY_hcfg" `8]Y < YfUi gZcfXYfi b[Yb `g]bX `j]Y`ZÀ`h][ž `UVYf `a]h `Y]bYf `_`UfYb \dip bcj Uh]c bgghfUhY[]Y `_ObbhY `XUg `J YfY]b][hY `? Ob][fY]WX `VYggYf Ui Z `ni _ØbZh][Y `? cbZ]_hY `fYU[]YfYb `i bX `X]Y `9]bgUhnVYfY]hgWX UZh Ui ZfYWXhYf\U`hYb"`Ni gUa a YbZUggYbX ``Aggh `g]WX `gU[Ybž `XUgg `X]Y ; fØbXi b[`j cb `l ? 8 = i bX `X]Y `\dip]h]Uh]j Yb `XYg `G8 F `Y]bYb `bYi Yb ?i fg `ZØf `X]Y `J YfhY]X][i b[g]bXi ghf]Y `XUfghY``Ybž `X]Y `Xf]b[YbX VYbOh][hY : `Yl]V]`]hAhii bX `FYU_h]cbggWX bY``][_Y]h `gWX UZZYb"$

 $: \varnothing f `k Y] h Y f Z \varnothing \ f Y b X Y ` + b Z c f a U h] c b Y b ` i b X ` 8 Y h U] ` g ` n i ` X] Y g Y a ` H \ Y a U g W X U i Y b ` G] Y ` g] W ` X] Y ` 6 Y f] W X h Y ` U b . ` H \ Y ` 8 Y Z Y b g Y ` D c g h ž ` h Y W X I ? i b X ` A G G ` 8 Y Z Y b W Y "$

8 YhU]`g	
Cfh	J Y f Y]b][h Y g '? Òb][f Y] W \
EiY``Yb	• h\ Y X Y ZY b gY d c gh"Wc a
	• k k k "hY W i _"cf[
	a ggXYZYbWY"Wca

6Ygi WXYb G]Y i bg Ui Z. k ca , + "XY