

K Yb][Yf'A Ø``[YVØ\fYb'UV'&\$&*.'BYi! I `a 'ZfYi h'g]W\'ØVYf'9bh`Ughi b[°

BYi !I `a 'gYb_h'A Ø``[YVØ\fYb'UV'&\$&*']b'Y`Z'?ca a i bYb bUW\'6YgW\`i gg'XYg'K Yf_Ui ggW\i ggYg"'6Øf[Yf]bZcg'Ua &+"#&, "'> b]'&\$&) "



BYi !I `a ž'8 Yi hgW\`UbX'!' \Rightarrow '@UbX_fY]g'BYi !I `a '[]Vh'Yg YfZfYi `]W\Y'BYi][_Y]hYb'ZØf'X]Y'6Øf[Yf]bbYb'i bX'6Øf[Yf.'8Yf K Yf_Ui ggW\i gg'\Uh'ŸbXYfi b[Yb'XYf'5VZU``[YVØ\fYbgUhni b[VYgW\`cggYbž'X]Y'UV'XYa '\$%"\\$\%*\"]b'Y`Z'?ca a i bYb'XYg @UbX_fY]gYg'[Y`hYb'k YfXYb"'8]YgY', VYfUfVY]hi b['j Yfgdf]W\h'b]W\h bi f'b]YXf][YfY'A Ø``[YVØ\fYbž'gcbXYfb'Ui W\'a Y\f'HfUbgdUfYbn i bX': `YI]V]`]hÀh']b'XYf'5VZU``k]fhgW\UZh"

6Øf[Yf]bbYb'i bX'6Øf[Yf'VYfY]hg'ZfØ\Yf'j cb'XYb'9]bgdUfi b[YbdfcZ]h]YfYb'_ÒbbYb"'@UbXfÀh]b'9j U'HfYi 'nY][h'g]W\'ØVYf'X]Y'bYi YbFY[Y'i b[Yb'ni Zf]YXYb'i bX'\YVh'X]Y'JcfhY]'Y'XYg'j Yf_ØfnhYbNY]hfU\a Ybg'\Yfj cf"

K YgYbh`]WXY ŸbXYfi b[Yb]a ', VYfV`]W_

- 8]Y'A]bXYgh`YYfib[Yb'kYfXYb'jcb'nkÒ`Z'UiZ'UW\h'dfc'\\f
- 8]Y FØW_ØVYfhfU[ib['XYf'UVZU``k]fhgWXUZh`]WXYb'5iZ[UVYbYfZc`[h'ZØf'X]Y'; YaY]bXYb'5`hYbghUXhž'6iWXž'<c`n\Y]až
 =`Yfh]ggYbž'?Y``aØbnž'CVYffch\ž'IbhYffch\ž'CghYfVYf[žDZUZZYb\cZYbž'Fc[[YbVif['ibX'KY]»Yb\cfb"
- , VYf'X]Y'ŸbXYfi b[Yb'k]fX'UV'&\$&*'Y]bY'_f]h]gWXY , VYfdfØZi b['ghUhhZ]bXYbž'j cf'U``Ya ']b'6Yni ['Ui Z U`hYfbUh]j Y'; YVØ\fYbgmghYa Yž'a]h'Y]bYf'a Ò[`]WXYb l a ghY``i b['UV'&\$&, "

JcfYfghrk]fX x]Y [Yd YubhY I a k UbX i b [XYg K Yfhghc ZZ\cZg]b = Yfh]ggYb ni Y]bYa nk Y]hYb 9bhgcf[i b [gnYbhfi a 'Ui Z 9]g [Y Y [h" 8]Y 2 ZZbi b [gnY]hYb XYg VYghY\YbXYb K Yfhghc ZZ\cZg V Y]VYb YXcWX ii bj YfÀbXYfhž k Ug j cb j]Y Yb 6Øf[Yfb 'U`g dcg]h]j k U\f[Ybca a Yb k]fX" 5i WX X]Y 6Øf[Yfa Y]ghYf XYf VYhfc ZZYbYb ?ca a i bYb ii bhYfghØhnYb X]Y bYi Yb 5bdUggi b [Ybž X]Y]b Y]bYf XYf _ca a YbXYb 6Øf[Yf]bZcfa Uh]cbgj YfUbghU`hi b [Yb bÀ\Yf Yf`Ài hYfh k YfXYb" 8]YgY Z]bXYb Ua '&+"'\$\dangle b] *&\$&\$) ']b XYf Fch\hU`\U``Y 6i WX ii bX Ua '&, "'\$\dangle b] *&\$&\$) ']b XYf : i [[Yf\U``Y K Y]» Yb\cfb 'ghUhh"

; YVØ\fYbUbdUggi b[Yb]bAØbWXYb

K À\fYbX']b'BYi!I `a 'X]Y'; YVØ\fYb'g]b_Ybž'g]Y\h'X]Y'G]hi Uh]cb']b A ØbWXYb'Yhk Ug'UbXYfg'Ui g'''<]Yf'k]fX'X]Y'; YVØ\f'ZØf'X]Y

5VZU``Ybhgcf[i b['UV'&\$&) 'Ub[Y\cVYbž'j cf'U``Ya 'Ui Z[fi bX ghY][YbXYf'DYfgcbU`_cghYb'i bX'UbXYfYf'VYhf]YV`]WXYf

<YfUi gZcfXYfi b[Yb"'8]Yg'i a ZUgghY]bYb'5bgh]Y['XYf'; YVØ\fYb

ZØf'j YfgWX]YXYbY'A Ø``hcbbYbž'k]Y'Yhk U'Y]bYb'5bgh]Y['j cb'%ž) *

9i fc'ZØf'Y]bYb', \$!@]hYf!FYgha Ø``VY\À`hYf'a]h'Y]bYf'%(!hÀ[][Yb

@YYfi b["'8]YgY'9bhk]W_`i b[Yb'g]bX'i bhYf'UbXYfYa 'Ui Z'XUg 6fYbbghcZZYa]gg]cbg\UbXY`g[YgYhn'ni fØW_ni ZØ\fYbž'XUg'gY]h 5bZUb['&\$&(']b'?fUZh']ghž'gck]Y'Ui Z'gW\k Ub_YbXY'9f`ÒgY'Ui g'XYf A Ø``j YfVfYbbi b['i bX'XYa 'J Yf_Ui Z'fYWhWY`VUfYf'A UhYf]U`]Yb"

8]Y'A ØbWXYbYf'5VZU``[YVØ\fYb'nY]WXbYb'g]WX'YXcWX'Xi fWX i a ZUggYbXY'@Y]ghi b[Yb'Ui gž'k cVY]'X]Y'GhUXh']a 'JYf[`Y]WX'ni I a `UbX[Ya Y]bXYb'Ui Z'D`Uhn'XfY]'XYf'[Øbgh][ghYb'5bV]YhYf'`]Y[h'' Ni 'XYb'Ybh\U`hYbYb'@Y]ghi b[Yb'nÀ\`h'b]WXh'bi f'X]Y'fY[Y`a À»][Y @YYfi b['XYf'FYghl'i bX'6]chcbbYbž'gcbXYfb'Ui WX'_cghYb`cgY Bi hni b['XYf'K YfhghcZZ\ÒZY'i bX'i a ZUggYbXY'5VZU``VYfUhi b["'8]Y GhUXh'V]YhYh'XUa]h'Y]bYb'Fi bXi a !GYfj]WYž'XYf'j]Y`Y'6Øf[Yf ØVYfnYi [Yb'XØfZhY"

H]ddg ni f A Ø``[YVØ\fYbYfgdUfb]g

 $\label{thm:coh} I a `X]Y ?cghYb`ni `cdh]a]YfYbž'Ya dZ]Y `h'Yg`g]W ž'5VZÀ``Y`gck Y]h k]Y`a Õ[`]W `ni `j Yfa Y]XYb`i bX`b]W h'j Yfa Y]XVUfY`5VZÀ``Y`[i h'ni hfYbbYb"`8]Yg`_<math>ObbYb`X]Y`6\emptysetf[Yf]bbYb`i bX`6\emptysetf[Yf`XUni `bi hnYbž Ui Z'_`Y]bYfY`6Y\A`hYf`i a ni ghY][Yb`i bX`a]h'Y]bYa `%(!hA`[][Yb@YYfi b[gf\mh\aig`ni `UfVY]hYb"$

5VgWX`]Y» YbX:`Àggh'g]WX 'gU[Ybž'XUgg'X]Y'6Øf[Yf]bbYb'i bX'6Øf[Yf]a '@UbX_fY]g'BYi!I `a 'Xi fWX'X]Y'UbghY\YbXYb; YVØ\fYbgYb_i b[Yb'i bX'X]Y': `YI]V]`]g]Yfi b['XYf'5VZU``k]fhgWXUZh dfcZ]h]YfYb'k YfXYb''; `Y]WXnY]h]['nY][h'X]Y'G]hi Uh]cb']b'A ØbWXYbžk]Y'XmbUa]gWX'i bX'i bhYfgWX]YX`]WX'X]Y'A Ø``[YVØ\fYbdc`]h]_']b XYb'j YfgWX]YXYbYb'FY[]cbYb']gh''K Y]hYfY' \ddot Zcfa Uh]cbYb'ni 'XYb ŸbXYfi b[Yb'g]bX'Ui Z'XYb'K YVg]hYg'XYf'5VZU``k]fhgWXUZhgVYhf]YVY j YfZØ[VUf. I `a 'BYk gž'5K A 'A ØbWXYb'i bX'9J 5

8 Y hU]`g	
Cfh	BYi!I`a ž'8Yi hgWX`UbX
EiY``Yb	• k k k "i `a !bYk g"XY
	• k k k "Uk a !a i YbWXYb"XY

8 YhU]`g	
	k k k "Yj U!UVZU``Ybhgcf[i b["XY

 $6\,Y\,gi\ WX\,Y\,b\,{}^*G\,]Y\,{}^*i\ b\,g\,{}^*Ui\ Z.\,{}^*b\,U[\ !\,V\,UmY\,fb\,"X\,Y$