H\Y`ZYgh]j ]h]Yg`\_]W\_YX`cZZ`k ]h\`Ub`Y`YWhf]Zm]b[`Yj Ybh`WU``YX`6`]hnž \Y`X`cb`K YXbYgXUm`b][\h`Uh`h\Y`7Uh\Yf]bY`<U```GhUX]i a [fci bXg"`≜h`k Ug`U`b][\h`hc`fYa Ya VYfž`a Uf\_YX`Vm`Ub`U``!V`UW\_ Uhh]fY`h\Ya Y`h\Uh`UXXYX`U`hci W\`cZ`Y`Y[UbWY`hc`h\Y`dfcWYYX]b[g"

A cbhY[c'6Umž'>Ja U]WJ'!FY[[UY'Gi a ZYgh'&\$&) `\Ug'hU\_Yb'cj Yf A cbhY[c'6Umž'>Ja U]WJž'g\ck WJg]b['h\Y'gd]f]h'cZ'fY[[UY'a i g]W `]\_Y'bYj Yf'VYZcfY"'H\]g'Ubbi U`'a i g]WZYgh]j U`ž'WY`YVfUhYX'Ug'h\Y [fYUhYgh'fY[[UY'ZYgh]j U`']b'h\Y'k cf`Xž'\Ug'UhhfUWhYX``cWJ`g'UbX ]bhYfbUh]cbU`'j ]g]hcfg'U`]\_Yž'YU[Yf'hc'gcU\_']b'h\Y'j ]VfUbh'W' `hi fU` YI dYf]YbWYg']h'cZZYfg"': fca '> `m'%( 'hc'&\$ž'h\Y'ZYgh]j U` YbWJdgi `UhYg'U'k YY\_!`cb['WY`YVfUh]cb'cZ'a i g]Wž'XUbWYž'UbX Wca a i b]hmž'Z]``]b['h\Y'U]f'k ]h\']bZYWh]ci g'YbYf[m'UbX'[ccX'j]VYg"



FY[[UY'GiaZYgh'&\$&)`]b`AcbhY[c`6Um'WY`YVfUhYg`aig]W UbX`W'`hifYž'g\ckWUg]b[`hcd`Ufh]ghgž'j]VfUbh`dYfZcfaUbWYgž UbX`Wcaaib]hm`gd]f]h"

## FY[[UY'Gi a ZYgh'&\$&). 5 GdYWhUW' Uf 7 Ug\ cZ'HU`Ybh']b A cbhY[c'6Um'

5gʻh\YʻZYgh]j U``Wcbh]bi Ygž'Ubh]W]dUh]cb`Vi ]`XgʻZcf`hcb][ \h g YI W]h]b[``]bYi d`cb`: Ygh]j U``B][ \h`CbYž'ZYUhi f]b[`V][`bUa Yg``]\_Y J mVn`? UfhY`ž'G\_Yb[`ž'@UXYbž'; cj UbUž'&Ja U`ž'UbX`Hca a m`@YY GdUfhU"`H\Y`[fUbX`Z]bU`Y`cb`GUhi fXUm`b][ \h`dfca ]gYg i bZcf[ YhhUV`Y`dYfZcfa UbWYg`Zfca `UVWVU]a YX`Ufh]ghgʻgi W\`UgʻHcb] 6fUI hcbž`Dfchc Yž'@]`U`=\_Åž`UbX`HUffi g`F]`Ymž'k \c`k]```dUm`hf]Vi hY hc`\]g``UhY`ZUh\Yfž'a]a a m`F]`Ym"`5XX]h]cbU``mž'hf]Vi hYgʻhc`fY[[UY `Y[YbXg`8Ybb]g`6fck b`UbX`; fY[cfm`=gUUWg`k]```VY`XY`]j YfYX`Vm

## K \Uhg`BYIh'Zcf`h\Y': Ygh]j U`3

H\Y'ZYgh]j U``\Ug'gYYb'a Ubm'hU`YbhYX'Ufh]ghg'hU\_Y'h\Y'ghU[Yž ]bWi X]b['; \UbU]Ub'ghUf'A c`]mž'k \c'a UXY'\Yf'Gi a ZYgh'XYVi h k ]h\`\Yf'YbYf[Yh]W\]h' G\U\_Y'=h'Hc'H\Y'A UI ž 'UWWca dUb]YX'Vm Ub'Ybh\i g]Ugh]WXUbWY'WfYk "'M b['6fYXXU'U`gc'a UXY'k Uj Yg'k]h\ \]g'Ubh\Ya ' H\Y'; fYUhYgh'6YbX'Cj Už 'g\ck WUg]b['U'Zi g]cb'cZ gcWU'j ]VYg'h\Uh'fYgcbUhYX'k Y```k]h\'h\Y'UhhYbXYYg"'H\Y'gi WWYgg cZ'A cbXUmg'ghfYYh'XUbWY'UbX'Hi YgXUmg'U``!k \]hY'dUfhm'Uh'D]Yf CbY'Zi fh\Yf'dfcj Yg'h\Uh'h\YgY'Yj Ybhg'UfY'hUdd]b[']bhc'h\Y'di `gY

\]g`hfUX]h]cbU``dUfhbYf`kUg`UkUm"

5XX]b[`hc`h\Y`ZYgh]j]h]Yg`k Ug`h\Y`; `cVU`: YhY`Gci bX`7`Ug\ž ZYUhi f]b[`U`Z]YfWY`Wca dYh]h]cb`VYhk YYb`j YhYfUb`gY`YWhcfg`Hcbm A UhhYf\cfb`UbX`@]hh`Y`G\UVVU"`H\]g`WUg\`k Ug`bch\]b[`g\cfh`cZ Y`YWhf]Zm]b[ž`k]h\`A UhhYf\cfb`gd]bb]b[`\]hg`Zfca `A Uj UXc`UbX J mVn`? UfhY`ž`k \]`Y`G\UVVU`Wci bhYfYX`k]h\`\]g`ck b`g][ bUhi fY hfUW\_gž`]bWi X]b[`U`gdYW]U``Xi Vd`UhY`Zfca `A UhhYf\cfb`h\Uh`gYbh W\YYfg`YW\c]b[`h\fci [\`h\Y`j Ybi Y"`I`h]a UhY`mž`G\UVVU`Ya Yf[YX j]Whcf]ci g`Zcf`h\Y`gYWcbX`WcbgYW'h]j Y`mYUfž`dYfZcfa ]b[`gc`c`Ug

## Gci bX'7`Ug\'G\ck Xck b

5a cb[`h\Y`ghUbXci h`dYfZcfa UbWYg`k Ug`GhU`\_`5g\`Ymž`k \c XY`]j YfYX`U``]j Y`m`gc`c`gYhž`V`YbX]b[`F/ 6ž`XUbWY\U``ž`UbX`gci ``hc \_YYd`h\Y`Wfck X`cb`h\Y]f`ZYYh"`H\Y`YI W]hYa Ybh`\Y][\hYbYX`k \Yb 5g\`Ym`hYUa YX`i d`k ]h\`JU`]Ubh`hc`dYfZcfa `h\Y]f`dcdi `Uf`hfUW\_ BUfW]gg]gh]Wz `dfcdY``]b[`h\Y`Ui X]YbWY`]bhc`U`ZfYbnm"

## 6Yqi WXYb'G]Y'i bg'Ui Z. a Y]b!k ]Yb"bYh

8 Y hU]`g	
Cfh	AcbhY[c`6Umž`*JaU]WU
EiY``Yb	• k k k "WUf]VVYUbbUh]cbU`k YY_`m"W
	са
	• fY[[UYgi a ZYgh"Wca
	• ′Ua UX]c"Wc

 $ZY gh = U^{(1)} [ \ \ ] [ \ ] [ \ ] b = [ \ ] b = [ \$ 

=b`YqqYbWYžFY[[UY`Gi a ZYqh`]q`a i WX`a cfY`h\Ub`'i qh`U`a i q]W ZYqh]i U`"`=h`qYfi Yq`Uq`U`i ]VfUbh`]bhYfqYWh]cb`k \YfY`W``hi fYž Wcaaib]hmžUbX'WYYVfUh]cb'WcaY'hc[Yh\YfžYbWUdgi`Uh]b[ YjYfmh\]b[`h\Uh`fY[[UY`ghUbXg`Zcf``dYUWYž``cjYž'UbX`ib]hm"': cf a cfY XYhU]`q UVci h h Y ZYqh]j U`ž'j ]q]h h Y c ZZ]W]U` F Y [ UY Gi a ZYgh'g]hY'hc'Yl d`cfY'Yj Yfmh\]b['h\]g'j ]VfUbh'Yj Ybh'\Ug'hc cZZYfžUbXWXYW\_cih7Uf]VVYUbBUh]cbU`KYY\_`mZcfacfY

hcif]ga "

H\Y'W'`hi fU``]a dUWh'cZ'FY[[UY'Gi a ZYgh'WUbbch'VY'cj YfghUhYX"'5g \][\`][\hYX`Vm`JaUX]cž`JaU]WU`\cqhq`cjYf`%) `fY[[UY`aiq]W  $ZY gh_{i} U^{t} U^{t} U^{t} h^{U} h^{t} U^{h} U^{t} h^{U} h^{t} U^{t} h^{U} h^{t} U^{t} h^{U} h^{t} U^{t} h^{U} h^{t} h^{U} h^{U} h^{t} h^{U} h^{U} h^{t} h^{U} h^{U} h^{t} h^{U} h^{U} h^{t} h^{U} h^{U}$ hcif]ghg`UbX`Wcbhf]Vih]b[`UfcibX``'\$`a]``]cb`hc`h\Y`Wcibhfmg hcif]ga `]bXi ghfm`YUW\ 'mYUf" 'H\]g`WY`YVfUh]cb bch cb `m`\][\`][\hg YghUV`]q\YX`Ufh]qhq`Vi h`U`qc`dfcj ]XYg`U`d`UhZcfa `Zcf`Ya Yf[]b[ hU`Ybh'hc'g\]bY"'@cWU`'j YbXcfg'VYbYZ]h']a a YbgY`m'hccž'k ]h\ Uddfcl]aUhY`m`\*\$i 'dUfh]W]dUh]b['VY]b['`cWU``Vig]bYggYgžcZZYf]b[ a i W. ! bYYXYX 'YWcbca ]WVccgh ]b 'U 'Wca a i b ]hm \ YUj ]`m fY`]Ubh cb

7\YahYfA]``YfUbX'HYfYbWY'KU``YbžfYadYWh]jY`m"