

# K Yf'j Yfa ]ggh'gY]b : U\ffUX3'Dc`]nY] 6i I hY\i XY'gi W\h'9][ YbhØa Yf

8]Y`Dc`]nY]`6i | hY\i XY`gi W\h`XYb`fYW\ha À»][Yb`9][YbhØa Yf Y]bYg`g]W\Yf[YghY``hYb`: U\ffUXg"`<]bk Y]gY`V]hhY`Ub \$(%\*%!\*(+%%)"

 $8 ]Y `Dc`]nY] `6i I hY \ i XY `]gh' Ui Z'XYf `Gi W. Y `b UW. `XYa `fYW. ha Å ` ][ Yb 9][ YbhØa Yf `Y]bYg `: U \ ffUXgž `XUg `]b `XYb `ZfØ \ Yb `$ b]! HU[ Yb g]W. Yf[ YghY``h'k i fXY" `5a `$) " `$ b] `&$&' `VYc VUW. hYhY `Y]b Ui Za Yf_gUa Yf `NYi [ Y `Y]bYb `V]g`Ub[ `i bVY_UbbhYb `HÀhYfž `XYf i b[ YVYhYb `Y]b `; fUZZ]h] `Ui Z'Y]b `K ]bXfUX `]a `6YfY]W. `5dYbgYb gdfØ \ hY " `5`g `XYf `NYi [ Y `XYb `i bVY_UbbhYb `?i bghgW. UZZYbXYb _cbZfcbh]YfhYž `Yf[ f]ZZ `X]YgYf `X]Y : `i W. h'i bX ``]Y " `XUVY] `Y]b `: U \ ffUX ni fØ W_ž `XUg `X]Y `Dc`]nY] `UbgW. `]Y " YbX `g] W. YfhY "$ 

 $8 \ Ug'g]WXYf[\ YghY``hY':\ U\ ffUX\check{z}'Y]b'A\ cXY```XYf'A\ Uf_Y'6=7 \ M7 @9G F "8 9F '7 L &$$']b'Y]bYa 'Ui ZZÀ``][\ Yb'V`Ui !VfUi bYb': UfVhcbž']gh']bY]bK UbXZfY]Ya 'Ni ghUbX'i bX'_<math>ObbhY'Y$ ]bYa '[` $Ow_$ `]WXYb'6Yg]hnYf [Y\ $OfYb\check{z}'XYf'bi\ b'j\ ]Y``Y]WXh'gY]bY'7 \UbWY'k\ ]hhYfhž'Yg k ]YXYfni Yf`Ub[Yb"$ 

# 8YhU]`gʻni a ˈJ cfZU``

 $8 ]Y G]hi Uh]cb YfY][bYhY g]WX ]b 5dYbgYbžY]bYf _ Y]bYb ; Ya Y]bXYŽ X]Y ZØf ]\fY ``AbX`]WXY = Xm`Y 'VY_Ubbh']gh'' C V[`Y]WX 'XYf 'HAhYf']b X]YgYa 'A ca Ybh'gY]bY Gdi fYb `\]bhYf`]Y <math>\Rightarrow$  ž']gh'XYf : c\_i g'XYf Dc`]nY] bi b 'XUfUi Z'[Yf]WX hYhž'XUg': U\ffUX 'a ]h'XYa 'j cf\Yf][Yb '6Yg]hnYf ]b 'J YfV]bXi b[ 'ni 'Vf]b[Yb'' 8]Y '9fa ]hh`Yf'XYf'Dc`]nY]]bgdY\_h]cb GhUXY 'ZfU[Yb 'X]Y '^2 ZZYbh`]WX\_Y]h'i a '<]`ZY . K Yf'Yf\_Ybbh'XUg'\]Yf UV[YV]`XYhY': U\ffUX 'cXYf'\_Ubb '5b[UVYb'ni 'XYggYb'9][YbhØa Yf a UWXYb3

8 Yf'NYi [Yž'XYf'XYb'JcfZU```a Y`XYhYž'gd]Y`hY'Y]bY'YbhgW\Y]XYbXY Fc``Yž']bXYa 'Yf'b]W\h'bi f'Ui Za Yf\_gUa 'k Ufž'gcbXYfb'Ui W\ i a [Y\YbX'X]Y'Dc`]nY]']bZcfa ]YfhY'''Gc`W\Y'NYi [Yb'g]bX'j cb i bgW\\AhnVUfYa 'K Yfhž'XU'g]Y'cZh'YbhgW\Y]XYbXY'<]bk Y]gY'`]YZYfbž X]Y'ni f'5i Z\_`\Afi b['j cb'JYf[Y\Yb'VY]hfU[Yb'\_\ObbYb'''\delta'X]YgYa : U```k i fXY'X]Y'Dc`]nY]'gW\\bY```U\_h]j 'i bX'fØW\_hY'Ui gž'i a 'XUg ni fØW\_[Y`UggYbY': U\ffUX'g]W\Yfni ghY``Ybž'k \A\fYbX'XYf'H\AhYf VYfY]hg'XUg'K Y]hY'[Yqi W\h'\Uh\Y''

- 9]b'i bYfk UfhYhYf'JcfZU``.; fUZZ]h]'U`q'5i q`ÒqYf
- A Uf\_Y'i bX'Ni ghUbX'XYg': U\ffUXg. '6=7 M7@9G'F'Y89F 7L&\$\$
- 8]Y'9]b`UXi b['XYf'Dc`]nY]'i a 'A]h\]`ZY'XYf'6Yj Ò`\_Yfi b[

I a 'XUg': U\ffUX'ni ']XYbh]Z]n]YfYbž'\UVYb'X]Y'6YUa hYb'Y]b': chc XYg'Nk Y]fUXg']b']\fYf'X][ ]hU'Yb'DfYggYa UddY'j YfÒZZYbh']W\h' 8 ]YgY'5fh'XYf'² ZZYbh']W\\_Y]hgUfVY]h'\Uh'g]W\'\Ài Z][ 'VYk À\fhž ]bgVYgcbXYfY'k Ybb'Yg'XUfi a '[ Y\hž'[ Yghc\'YbY'cXYf Ui Z[ YZ bXYbY'; Y[ YbghÀbXY'ni 'Y]bYa 'fYW\ha À»][ Yb'6Yg]hnYf ni fØW\_ni Vf]b[ Yb''8 Ug'9f\_YbbYb'Y]bYg': U\ffUXg'\_Ubb'Ub\UbX'j cb W\UfU\_hYf]gh]gW\Yb'A Yf\_a U`Yb'cXYf'gdYn]Z]gW\Yb'?ca dcbYbhYb YfZc`[ Ybž'k Ug'ZØf'X]Y': U\bXi b[ 'j cb'VYXYi hYbXYf'K ]W\h][ \_Y]h']gh"

# $K ]Y G]Y Y ZYb _ObbYb$

8]Y'Dc`]nY]`\Uh'X]Y'6Øf[Yf'XUni 'Ui Z[Yfi ZYbž'g]W\ a ]h'<]bk Y]gYb X]fY\_h'Ub'XUg'Dc`]nY]\_ca a ]ggUf]Uh'6i I hY\i XY'ni 'k YbXYb"'I bhYf XYf'HY`YZcbbi a a Yf'\$(%\*%!\*(+%%)'\_ObbYb'A YbgW\Yb \dagger Zcfa Uh]cbYb'ØVYf'XUg'6]\_Y'cXYf'a O[`]W\Y'9][YbhØa Yf'a Y`XYb" 9]b'Y]bZUW\Yg'HY`YZcbUh'\_ObbhY'Ui gfY]W\Ybž'i a 'Ya UbXYa 'gY]b 9][Ybhi a 'ni fØW ni [YVYb"

Gc`W.Y'5i Zfi ZY'ghÀf\_Yb'b]W.h'bi f'XUg'J YfhfUi Yb'nk ]gW.Yb'XYf Dc`]nY]'i bX'XYf'; Ya Y]bgW.UZhž'gcbXYfb'\YVYb'Ui W.X]Y 6YXYi hi b[ 'XYf'Ni gUa a YbUfVY]h'ZØf'X]Y'G]W.Yf\Y]h'i bX'CfXbi b[ ]b'XYf'FY[ ]cb'\Yfj cf"'8 Ug'9b[ U[ Ya Ybh'XYf'6Øf[ Yf'VY]'XYf 6YcVUW.hi b[ 'i bX'A Y'Xi b[ 'j cb'J YfXÀW.h][ Ya ']gh'Y]bY'k Yfhj c``Y FYggci fW']b'XYf'Dc`]nY]UfVY]h''

K Yf'hfÀi a h'b]Wk h'XUj cbžgY]b'j Yf'cfYb'[Y[`Ui VhYg': U\ffUX ni fØW\_ni VY\_ca a Yb3'9]b'\_`Y]bYg'V]ggWk Yb'5i Za Yf\_gUa \_Y]h'i bX gWk bY``Y'9bhgWk Y]Xi b[Yb'\_ObbYb'cZh'XYb'YbhgWk Y]XYbXYb I bhYfgWk]YX'Ui ga UWk Yb"'\dangle Y]bYa 'NY]hU`hYfž']b'XYa 'X]Y ?ca a i b]\_Uh]cb'gWk bY``i bX'Y]bZUWk']ghž']gh'Yg'k ]Wk h][ž'X]Y'5i [YbcZZYb'ni '\U`hYb'i bX'U\_h]j 'ni 'k YfXYbž'k Ybb'Yhk Ug'b]Wk h'gh]a a h'' 9]b'Ui Za Yf\_gUa Yf'BUWk VUf'\_Ubb'XYf'GWk`ØggY`'gY]bž'i a 'YbYg : U\ffUX'gY]bYa 'fYWk ha À»][Yb'9][YbhØa Yf'ni fØW\_ni ZØ\fYb"

#### 8]Y 6YXYi hi b[ 'j cb': U\ffUXfY[]ghf]Yfi b[

8]Y'FY[]ghf]Yfi b['j cb': U\ffàXYfb']gh'Y]b'k]Wkh][Yf'GWkf]hh'ni f
6Y\_Àa dZ b['j cb': U\ffUXX]YVghÀ\`Yb'i bX'ni f'=XYbh]Z]n]Yfi b[
[Yghc\`YbYf'FÀXYf"'=b'j]Y`Yb'GhÀXhYb'i bX'; Ya Y]bXYb'V]YhYb
Dc`]nY]'i bX'`c\_U`Y'Cf[Ub]gUh]cbYb'Dfc[fUa a Y'Ubž'VY]'XYbYb
FUXZU\fYf']\fY': U\ffÀXYf'fY[]ghf]YfYb'`UggYb'\_ObbYb"'8]Yg'\]`Zh
b]Wkh'bi f'VY]'XYf'5i ZZ]bXi b['[Yghc\`YbYf': U\ffÀXYfž'gcbXYfb
V]YhYh'Ui Wk'Y]bYb'[Yk]ggYb'GWki hn'ZØf'X]Y'9][YbhØa Yf"

# 5\_hi Y``Y'HfYbXg']a : U\ffUXX]YVghU\`

± XYb `YhnhYb '\*J\fYb `\Uh'g]W\ XYf `HfYb X `]a :: U\ffUXX]YVghU\`
j YfÀb XYfhž'k cVY] X]Y 'a Y]ghYb 'J cfZÀ``Y `]b 'ghÀXh]gW\Yb '; YV]YhYb
ghUhhZ]b XYb "'@Ui h'XYb 'j YfÒZZYbh`]W\hYb 'GhUh]gh]\_Yb 'XYg '8 Yi hgW\Yb
: U\ffUX 'J YfVUb XYg 'fB: J Ł'g]b X 'GhÀXhY 'k ]Y '6Yf`]b 'i b X '< Ua Vi f[
< chgd chg 'ZØf': U\ffUXX]YVghÀ\`Y" '± 'X]YgYb 'GhÀXhYb ']gh'Yg
VYgcb XYfg 'k ]W\h][ ž'G]W\Yf\Y]hga U» bU\a Yb 'ni 'Yf[ fY]ZYb ž'i a 'XUg
: U\ffUX 'j cf'8 ]YVghU\`ni 'gW\ØhnYb" '8 ]Y 'J Yfk YbXi b[ 'j cb

\cWk Yfh][ Yb 'GWk 'OggYfbž'XUg'9]b`c[ [ Yb ']b
: U\ffUXfY[ ]ghf]Yfi b[ ggmghYa Y'i bX'X]Y'HY]`bU\a Y'Ub'`c\_U`Yb
DfAj Ybh]cbg\_Ua dU[ bYb'g]bX'Y]b][ Y'XYf'Ya dZc\`YbYb
A U» bU\a Yb"

#bhYfYggUbhYfk Y]gY`\UVYb`G]W\Yf\Y]hgZUW\`Yi hY`Ui W\`ZYgh[ YghY``hž XUgg`VYgh]a a hY`: U\ffUXhmdYb`\Ài Z][ Yf`[ Yghc\`Yb`k YfXYb" <cW\k Yfh][ Y`9!6]\_Yg`i bX`8Yg][ bYf!: U\ffÀXYf`g]bX`cZh`N]Y`Y'j cb 8]YVYbž`XU'g]Y`]a `K ]YXYfj Yf\_Ui Z'Y]bYb`\Ò\YfYb`K Yfh`\UVYb" 8]Yg`\_Ubb`VYXYi hYbž`XUgg`6Yg]hnYf`j cb`hYi fYb`: U\ffÀXYfb ni gÀhn`]W\Y`G]W\Yf\Y]hga U» bU\a Yb`]b`6YhfUW\h`n]Y\Yb`gc``hYbž i a `]\fYb`6Yg]hn`ni `gW\ØhnYb"

# Dc`]nY]'i bX'; Ya Y]bgWX UZhg]b]h]Uh]j Yb

I a 'XYf'ghY][YbXYb'5bnU\`'j cb': U\ffUXX]YVghÀ\`Yb
Ybh[Y[Ybni k]f\_Ybž\UVYb'j]Y`Y'Dc`]nY]X]YbghghY``Yb'gdYn]Y``Y

♣D]h]Uh]j Yb']bg'@YVYb'[Yfi ZYb"'8 Uni '[Y\ÔfYb

♣DZcfa Uh]cbgj YfUbghU`hi b[Yb'ØVYf': U\ffUXg]WXYf\Y]hž'X]Y
6YfY]hghY``i b['j cb'G]WXYf\Y]hga UhYf]U`]Yb'i bX'X]Y': ÒfXYfi b['XYf
FY[]ghf]Yfi b['j cb': U\ffÀXYfb"'+D'j]Y`Yb'GhÀXhYb'k]fX'Ui WX'Yb[
a]h'Òfh`]WXYb': U\ffUX[YgWXÀZhYb'ni gUa aYb[YUfVY]hYhž'i a'X]Y
; YaY]bgWXUZh']b': fU[Yb'XYf': U\ffUXg]WXYf\Y]h'ni 'gWXi `Yb"

9]b '6Y]gd]Y` 'ZØf'Y]bY 'YZZY\_h]j Y'  $\Rightarrow$  ]h]Uh]j Y']gh'XUg : U\ffUXj YfnY]W\b]g ž'k Y`W\Yg'j cb'j YfgW\]YXYbYb'XYi hgW\Yb Gh\XhYb']bg'@YVYb'[ Yfi ZYb'k i fXY"'8]Yg']gh'Y]b'Cb`]bY!GmghYa ž XUg'X]Y'FY[ ]ghf]Yfi b[ 'i bX'  $\Rightarrow$  Ybh]Z]\_Uh]cb'j cb': U\ff\XYfb Yf`Y]W\hYfh'' Dc`]nY]'i bX'6Øf[ Yf'\_\ObbYb'gca ]h'[ Ya Y]bgUa 'ZØf a Y\f'G]W\Yf\Y]h'gcf[ Yb"

8 Y hU1`a