

## G]WXYf\Y]hgf]g]\_Yb']b'K]YgVUXYb. 9]bVfØWXY'i bX', VYf[f]ZZY'gcf[Yb'ZØf | bfi\Y

9]bVfi WXž', VYfZÀ``Y'i bX'JYf\_Y\fg\_cbhfc``Yb']b'K]YgVUXYb. 5\_hi Y``Y'Dc`]nY]a Y`Xi b[Yb'ni '8]YVghÀ\`Yb'i bX'JcfZÀ``Yb"

K ]YgVUXYb ' → Y]bYf'FY]\Y'j cb'J cfZÀ``Yb'\Uh'X]Y'Dc`]nY]'j cb
K ]YgVUXYb'\_Øfn`]W\'a Y\fYfY'GhfUZhUhYb'fY[ ]ghf]Yfhž'X]Y'j cb
9]bVfØW\Yb'V]g'\]b'ni '? ÒfdYfj Yf`Yhni b[ Yb'fY]W\Yb''8]Y
A Y`Xi b[ Yb'XYi hYb'Ui Z'Y]bYb'VYgcf[ b]gYffY[ YbXYb'HfYbX'\]bž
XYf'gck c\``?f]a ]bU`hYW\b]\_Yf'U`g'Ui W\'X]Y'6Øf[ Yf'VYgW\ÀZh][ h"
8]Y'[ YbUi Y'K ]f\_i b[ 'X]YgYf'9fY][ b]ggY'Ui Z'X]Y'HU[ YgcfXbi b[ 'XYf'GhUXh'V`Y]Vh'UVni k UfhYb"

5a ~&&"~5i [i ghr&\$&( 'k i fXY'Y]b~9]bZUa ]`]Yb\Ui g~]b~K ]YgVUXYb!
BcfXYbghUXh~N]Y~j cb~9]bVfYWXYfb"~&~XYf~NY]h~nk ]gWXYb~\$&.' (
I \fi bX~\$&.' , I \fr[Y`Ub[hYb~i bVY\_UbbhY~HÀhYf~cZZYbVUf~a ]h
Y]bYa~GWX~ØggY~Ui Z~XUg~; fi bXghØW\_Ua~K U~Ui Yf~K Y["~K À\fYbX
X]Y~6Yk c\bYf~gWX~]YZYbž~Ybhk YbXYhYb~X]Y~HÀhYf~b]WXh~bi f
6Uf[Y`Xž~gcbXYfb~Ui WX~Y]bYb~5i hcgWX~ØggY~i bX~Y]bY
Ga~Ufhk UhWX~K Yf~X]Y~9]bVfYWXYf~k UfYb~i bX~k c\Yf~g]Y~XYb
GWX~ØggY~ZØf~XUg~Hcf~\UhhYbž~V~Y]Vh~Y]b~F~AhgY~"~8]Y
?f]a~]bU~dc~]nY]~\Uh~X]Y~9fa~]hh~i b[Yb~Ui Z[Ybca~a~Yb~i bX~V]hhYh
i a~<]bk~Y]gY"

## ? OfdYfj Yf`Yhni b[ 'Ua '6U\b\cZ

9]b'k Y]hYfYg'YfgW\fYW\_YbXYg'9fY][b]g'ZUbX'Ua '&%"'5i [i gh'&\$&(]b'A U]bn!?UghY`'ghUhh"'9]b': U\f\_UfhYb\_cbhfc``Yi f'k i fXY'VY]a
J Yfgi W\ž'nk Y]': U\fgW\Y]bdfØZYf'a ]h'i b[Ø`h][Yb'H]W\_Yhg'XUfUi Z
Ubni gdfYW\Ybž'Vfi hU``Ub[Y[f]ZZYb"'8Yf'i bVY\_UbbhY'HÀhYf'gW\`i [

XYa ?cbhfc``Yi f`ZØbZ'V]g`gYW\g`A U``a ]h`XYf`: Ui gh`]bg`; Yg]W\hž VYj cf`Yf`a ]h`gY]bYa `6Y[ `Y]hYf`ZØW\hYhY"`8Yf`5b[ f]ZZ'YfY][ bYhY g]W\`Yhk U`i a `%) .) \$`I \f`Ua `; `Y]g`%`XYg`6U\b\cZg"`8Yf`HÀhYf k i fXY`U`g`^\ b[ Yf`A Ubb`VYgW\f]YVYbž`Yhk U`nk ]gW\Yb`%, `i bX`&\$ \J\fYb`U`h`i bX`a ]h`Y]bYa `gØX`ÀbX]gW\Yb`9fgW\Y]bi b[ gV]`X"

9]b k Y]hYfYf J cfZU```XYf'? OfdYfj Yf`Yhni b[ 'YfY][ bYhY'g]W 'Ua gY`VYb 'HU[ ']b K ]YgVUXYbž [ YbUi Yf'[ YgU[ h'Ub 'XYf'6i g\U`hYghY``Y 8 chn\Y]a Yf'GhfU» Y'#6]ga UfW\_f]b[ "'<]Yf'k i fXY'Y]b &, !\A\f][ Yf [ Y[ Yb'%, .&) 'I \f'j cb'Y]bYa 'I bVY\_UbbhYb'Ub[ Y[ f]ZZYbž'XYf'Ui g Y]bYa '6i g'XYf'@]b]Y') 'gh]Y[ "'8Yf', VYfZU``ž'XYf'a ]h'a Y\fYfYb GW\`A[ Yb']bg'; Yg]W\h'YbXYhYž`]Y» 'XYb'A Ubb'j Yf`Yhnhini f $\emptyset$ W\_" 5i W\`\]Yf'V`Y]Vh'XUg'A ch]j 'XYg'5b[ fY]ZYfg'i b\_`Uf'i bX'X]Y'Dc`]nY] ]gh'Ui Z'XYf'Gi W\Y'bUW\`NYi [ Ybž'X]Y'<]bk Y]gY'ni 'XYa 'J cfZU`` [ YVYb'\_ObbYb"

## 8]YVghÀ\`YibXGWXÀXYbUb:U\fnYi[Yb

8]Y'BUW\h'j cb'&%"'Ui Z'XYb'&&"'5i [i gh'&\$&( 'gU\'Ui W\'Y]bYb Fc``Yf!8]YVghU\`']b'K ]YgVUXYb!8chn\Y]a "'9]b'&\!\A\f][Yf'ghY``hY gY]bY'gW\k UfnY'D]U[[]c'JYgdU']a 'K Yfh'j cb'Yhk U'' "\$\$\$'9i fc']a Jcf[UfhYb'UV"'5a 'A cf[Yb'k Uf'g]Y'j YfgW\k i bXYb'i bX'X]Y'Dc`]nY] gi W\h'bi b'bUW\'<]bk Y]gYb'ni a 'JYfV`Y]V'XYg': U\fnYi [Yg" \\Y\b`]W\Yg'YfY][bYhY'g]W\']b'K ]YgVUXYb!6]YVf]W\\Z'k c'Y]b'D\_k \\Z'Y]b \\X'Yd'; fUbX'7\Yfc\_YY']a 'K Yfh'j cb'') "\$\$\$'9i fc\\Z'j ca 'DUf\_d`Uhn Y]bYg'5i hc\Ui gYg'[Yghc\`Yb'k i fXY"'8]Y'H\AhYf'\@VYfk UbXhYb'X]Y 5VgdYffi b[Yb'i bX'Ybh\_Ua Yb'a ]h'XYa ': U\fnYi ['c\bY <]bhYf`Uggi b['j cb'Gdi fYb"

?Y]bY'Fi\Y'ZØf'X]Y'5bk c\bYf.'\D'XYf'; Yf]WkhgghfU\(\text{y}\) Y'k i fXYb nk ]gWkYb'XYa '\&\"'5i [i gh'i bX'XYa '\&' "'5i [i gh'\&\\$\&( 'nk Y] : YbghYf'XYf': 8D!; YgWk\\AZhgghY``Y'Y]b[YgWk`U[Yb"'I bVY\_UbbhY VYgWka]YfhYb'Y]bY'GWkY]VY'a]h'Y]bYa 'GWkf]Zhni [\(\text{z}\)k Ug'Y]bYb GUWkgWkUXYb'j cb'Yhk U'' "\\$\\$\\$'9i fc'j Yfi fgUWkhY"'\9]b gWkc\(\text{W}\)]YfYbXYg'6]`X'j cb'J UbXU`]ga i g\(\text{z}\)XUg'YVYb\(\text{Z}\)``g'X]Y 9fa]hhi b[Yb'XYf'Dc`]nY]'Ui Z'XYb'D`Ub'f]YZ''

±ba ]hhYb X]YgYf J c fZÀ``Y ZØ\fhY X]Y Dc`]nY] ]b K ]YgVUXYb Ua &&"

## 8]Y < YfUi gZcfXYfi b[Yb XYf G]WXYf Y]hg`U[Y

8]Y '9bhk ]W\_`i b[Yb']b'K]YgVUXYb'k YfZYb'Y]b'@]W\h'Ui Z'X]Y < YfUi gZcfXYfi b[Ybž'j cf'XYbYb'X]Y'G]W\Yf\Y]hg\_fÀZhY'i bX'X]Y; Ya Y]bXY'ghY\Yb"'A]h'ni bY\a YbXYa 'JUbXU`]ga i gž'8]YVghU\`i bX'; Yk U'hUbk YbXi b[']gh'Yg'k]W\h][ž'XUgg'X]Y'; Ya Y]bgW\UZh ni gUa a YbUfVY]hYhž'i a '@Ògi b[Yb'ni 'Z]bXYb'i bX'X]Y'G]W\Yf\Y]h ZØf'U``Y'6Øf[Yf'ni '[Yk À\f`Y]ghYb"'8]Y'Dc`]nY]'ZcfXYfh'6Øf[Yf'Ui ZžU\_h]j 'ni 'k YfXYbž'j YfXÀW\h][Y'DYfgcbYb'ni 'a Y`XYb'i bX'g]W\'Yfgh VY]'6YXUfZ']b'; YZU\fYbg]hi Uh]cbYb'ni 'VY[YVYb"'8]Yg'\_ÒbbhY\Y`ZYbž'k Y]hYfY'J cfZÀ``Y'k]Y'X]Y'ni `Yhnh'VYf]W\hYhYb'ni jYf\]bXYfb"

#### < ]bhYf[ fi bX XYf GhfUZhUhYb ]b K ]YgVUXYb</pre>

8]Y'<Ài Z][\_Y]h'j cb'GhfUZhUhYb'k]Y'9]bVfØWXYbZ?
OfdYfj Yf'Yhni b[Yb'i bX'8]YVghÀ\`Yb']b'GhÀXhYb'k]Y'K]YgVUXYb
]gh'c Zh'Y]b'Gd]Y[Y'V]`X'XYf'gcn]U`Yb'i bX'k]fhgWXUZh`]WXYb

J Yf\À`hb]ggY"'+b'XYb'`YhnhYb'\*J\\fYb'k i fXY'Y]b'5bgh]Y['jcb

K c\bi b[gY]bVfØWXYb']b'ghÀXh]gWXYb'; YV]YhYb'VYcVUWXhYhZ'k Ug
Ui Z'j YfgWX]YXYbY': U\_hcfYb'ni fØW\_ni ZØ\fYb']ghZ'XUfi bhYf
k]fhgWXUZh`]WXY'I bg]WXYf\Y]hYbZ'Y]b'A Ub[Y`Ub'5fVY]hgd`AhnYb'i bX
gcn]U`Y'GdUbbi b[Yb"'@Ui h'XYf'Dc`]nY]`]WXYb'?f]a]bU`ghUh]gh]\_
fD?GL'[UV'Yg']b'8Yi hgWX`UbX']a'\*J\f'&\$&&'Y]bYb'`Y]WXhYb
FØW\_[Ub['VY]'K c\bi b[gY]bVfØWXYb']a''JYf[`Y]WX'ni 'XYb
J cf'U\fYbZ'YXcWX'V'Y]Vh'XUg'D\Abca Yb'Y]bYg'[Ygh]Y[YbYb
G]WXYf\Y]hgVYXUfZg']b'i fVUbYb'FY[]cbYb'VYghY\Yb"'

Dfàj Ybh]cbgdfc[fUa a Y']b]h]]Yfhži a '9]bVfØWXY'i bX'UbXYfY
?f]a ]bU`]hÀhgZcfa Yb'ni 'fYXi n]YfYb"'8 Uni '[Y\ÒfYb
5i Z\_`Àfi b[ga U» bU\a Yb'ni f'G]WXYfi b['j cb'K c\b\Ài gYfb'i bX
\dipZcfa Uh]cbgj YfUbghU`hi b[Yb'ØVYf'9]bVfi WXgWXi hn"'Hfchn'X]YgYf
A U» bU\a Yb'V`Y]Vh'X]Y'5bnY][Ybei chY'ZØf'9][Ybhi a gXY`]\_hY
fY`Uh]j '\cWXž'k Ug'VY\_fÀZh][hž'XUgg'?f]a ]bU`]hÀh'Y]b'Yfbgh'ni
bY\a YbXYg'DfcV`Ya 'V`Y]Vhž'XUg'X]Y'6Yj Ò`\_Yfi b['VYgcf[h"

# 5\_hi Y``Y`GhUh]gh]\_Yb`i bX`8UhYb`ni ?f]a ]bU`]hÀh

@Ui h'XYf'Dc`]nY]`]WXYb'?f]a ]bU`ghUh]gh]\_'&\$&&'k i fXYb']b'<YggYb ]bg[YgUa h'Yhk U'%) \$"\$\$\$'GhfUZhUhYb'fY[]ghf]Yfhž'k cVY]
9][Ybhi a gXY`]\_hYž'ni 'XYbYb'9]bVfØWXY'i bX'8]YVghÀ\`Y'nÀ\`Ybž
Yhk U'&- 'DfcnYbh'Ui ga UWXhYb"'9]b'6`]W\_'Ui Z'X]Y': U``nU\`Yb']b
K ]YgVUXYb'nY][ hž'XUgg'Yg'gdYn]Z]gWXY'<chgdchg'ZØf'?f]a ]bU`]hÀh
[]Vhž'X]Y'cZh'Xi fWX'gcn]cÒ\_cbca ]gWXY': U\_hcfYb'VYY]bZi ggh
k YfXYb"'8]Y'GhUXh'K ]YgVUXYb'\Uh'hfchn'Y]bYg'U``[Ya Y]bYb
FØW\_[Ub[g'j cb'GhfUZhUhYb'Y]b][Y'FØW\_gWX`À[Y']b'XYf
JYfVfYWXYbgVY\_Àa dZi b['\]bbY\a Yb'a ØggYbž']bgVYgcbXYfY'k Ug; Yk U`h!'i bX'9][Ybhi a gXY`]\_hY'VYhf]ZZh"

 $: \emptyset f^*XUg^* \pm 1 \setminus f^* \& \$ \&' \quad k \ ] fX \cdot Y fk \ UfhY hz^*XUgg^*X] Y^*Dc^*]nY]^*] \setminus fY$   $? cbhfc^*a \ U \gg b U \setminus a \ Y b^*j \ Y fgh A f_hz^*i \ a \ 'df A j \ Y b h] j^* [Y[Yb^*8Y^*]_hY j^* cfni \ [Y \setminus Y bz^*] b g V Y g c b X Y f Y^*] b^*g Y b g] V^*Y b^*6 Y f Y] W X Y b^*k \ ] Y$   $0 ZZY b h^*] W X Y b^*J \ Y f_Y \setminus fga \ ] h hY^*b^*i \ b X^*K \ c \setminus b \ [YV] Y h Y b^*'' \pm b^*Y] b Y a$   $6 Y f] W \lambda h^*X Y g^* < Y g g] g W \lambda Y b^* \pm b Y b a \ ] b ] g h Y f] i \ a \ g^*k \ i \ f X Y^*Z Y g h \ [Y g h Y^*hz^*] hz^* X U g g^*d f A j Y b h] j Y^*A \ U \gg b U \setminus a \ Y b^*] b^*: cfa^*j \ cb^*J \ Y f_Y \setminus fg_c b h fc^*Y b$   $i \ b X^*j \ Y f g h A f_h Y a^* \ 9] b g U h h^*X Y f^*D c^*] n Y]^*g h U h h Z] b X Y b^*k \ Y f X Y b z^*i \ a \ X U g$   $G] W \lambda Y f \setminus Y] h g [Y Z \emptyset \setminus X Y f^*6 \emptyset f \ [Y f^*ni \ g h A f_Y b^*i \ b X^*X] Y^*? f] a \ ] b U^*] h A h$   $k \ Y] h Y f^*ni \ g Y b_Y b^*i$ 

8 Yf '9]bgUhn 'X][]hU`Yf 'HYW bc`c[]Yb 'ni f', VYfk UW i b['i bX J YfVfYW YbgVY\_Àa dZ b['k]fX 'YVYbZU``g 'U`g 'dcg]h]j 'VYk YfhYhž XU a cXYfbY 'HYW b]\_Yb 'k]Y'; Yg]W hgYf\_Ybbi b['i bX'j YfbYhnhY, VYfk UW i b[ggmghYa Y'ni bY\a YbX']b 'X]Y 'GhfUhY[]Y 'XYf 'Dc`]nY]]bhY[f]Yfh'k YfXYb"'8]YgY 'HYW bc`c[]Yb'\_ObbYb'\Y`ZYbž HÀhYfgW bY``Yf 'ni ']XYbh]Z]n]YfYb'i bX'X]Y '5i Z\_`Àfi b[gei chY 'VY]

## 8 YhU]`g

# 6 Ygi WX Yb 'G]Y 'i bg 'Ui Z. 'b!U[ "XY