

# HYff]Yf!A ]I 'DUi `U'gi W\h'Y]b'`]YVYj c``Yg Ni \Ui gY']b'GhYbXU`

8 ]Y 'gY W  $\ g'$  \ f][ Y 'HY ff]Y f! A ]I ' <  $\emptyset$  b X ]b 'DUi `U 'gi W h'Y ]b `]Y VY j c ``Y g 'Ni \ Ui gY ']a 'H]Y f\ Y ]a 'GhY b X U `" '9 f ZU \ fY b Y < i b XY \ U `hY f 'g]b X '[ Y Z f U[ h'

8 Yf; fi bX']\fYg'5i ZYbh\U`hg']a 'H]Yf\Y]a 'ZØ\fhi bg'ni 'XYb < YfUi gZcfXYfi b[Ybž'a]h'XYbYb'j]Y'Y'H]YfVYg]hnYf'VY]'Y]bYa K c\bi b[gk YWkgY`'\_cbZfcbh]Yfh'k YfXYb"'=b'X]YgYa ': U``'\_cbbhY X]Y'Y\Ya U`][Y'6Yg]hnYf]b'j cb'DUi `Už'X]Y']b'Y]bY'K c\bi b['nc[ž]\fY'hfYi Y'6Y['Y]hYf]b'b]Wkh'k Y]hYf\]b'\U`hYb"'8Yf'Yhk U gYWkg'À\f][Y'HYff]Yf!A]I '\Uhrg]Wk'bi b'Ub'X]Y'j cfØVYf[Y\YbXYb@YVYbgVYX]b[i b[Yb']a 'H]Yf\Y]a 'Ub[YdUgghž'UVYf']\f'K i bgWk']gh\_`Uf.'DUi `U'a ÒWkhY'k]YXYf'HY]`'Y]bYf': Ua ]`]Y'gY]b"

### DUi `Ug`K i bgWX bUWX Y]bYa 'bYi Yb Ni \Ui gY

 $\label{eq:normalized_normalized$ 

#### $: \emptyset \setminus fi b[\check{z} \times X]Y \setminus f \cdot G]WXYf \setminus Y]h \cdot [Yh']$

DUI `U'nY][ hžk ]Y'j ]Y`Y'<i bXYžY]b'[ Yk ]ggYg'A U» 'Ub'I bg]W\Yf\Y]h''

♣ 'i b[ Yk c\bhYb'G]hi Uh]cbYb'\_ObbhY'Yg'XU\Yf'fUhgUa 'gY]bž'Y]bYb

A Ui `\_cfV'ni 'j Yfk YbXYbž'i a 'gck c\``DUI `U'U`g'Ui W\`UbXYfY

A YbgW\Yb'i bX'H]YfY'ni 'gW\ØhnYb"'→fY'FYU\_h]cbYb'\_ObbYb

i bj cf\YfgY\VUf'gY]bž'k Ybb'g]Y'g]W\'i bVY\U[`]W\'ZØ\`hž'k Ug

VYXYi hYhž'XUgg'?]bXYf']b']\fYa 'bYi Yb'Ni \Ui gY'a O[`]W\Yfk Y]gY

b]W\h']XYU`'g]bX"'8]Y'gUbZhY'<ØbX]b'\Uh'YXcW\'Y]bY'k Y]W\Y'GY]hY.

K Ybb'g]Y'Y]bY'6Yni [ gdYfgcb'[ YZ bXYb'\Uhž']gh'g]Y'Ài » Yfgh

`]YVYbgk ØfX][ ž'\_i gW\Y`h'[ YfbY'i bX'[ Yb]Y» h'Ygž'[ YVØfghYh'ni k YfXYb"

- 5`hYf.'7U"'\*'\\\fY
- FUggY. HYff]Yf!A]I
- ; Ygi bX\Y]h; i hY; Ygi bX\Y]hgni ghÀbXYž'VYbÒh][ h'UVYf Y]bY'YfZU\fYbY'6YhfYi i b[
- 6YgcbXYfY'6YXØfZb]ggY.'9]bZØ\`i b[gj Yfa Ò[Yb'i bX
  ; YXi `X'k À\fYbX'XYf'9]b[Yk Ò\bi b[

: U``gʻYa UbXʻ♣bhYfYggYʻUbʻDUi `UʻcXYf`Y]bYa ʻUbXYfYbʻH]YfʻUi g XYa ʻH]Yf\Y]a ʻ\Uhžʻ[]VhʻYgʻUi ZʻXYfʻK YVg]hYʻXYgʻH]Yf\Y]a gʻGhYbXU` 6cfghY``k Y]hYfYʻ♣bZcfa Uh]cbYb"ʻ9gʻ]ghʻk ]WXh][žʻXUggʻdchYbh]Y``Y UXcdhYfʻg]WXʻ]a ʻJcfZY`Xʻ[i hʻØVYfʻX]Yʻ6YXØfZb]ggYʻXYgʻH]YfYg ]bZcfa ]YfYbžʻi a ˈg]WXYfni ghY``YbžʻXUggʻDUi `UʻYbX`]WXʻXUgʻNi \Ui gY Z]bXYhžʻXUgʻg]YʻgcʻgY\fʻj YfX]Ybh`\Uh"

# 8]Y 6YXYi hi b[ 'j cb 'H]YfgWXi hn 'i bX '5Xcdh]cb

8 Y f :: U ``` j cb `DUi `U `]gh Y I Ya d`U f]g W `ZØf `j ]Y `Y '< i b X Y ž X]Y `Ui Z[ fi b X j cb `J Y f Àb X Y fi b [ Y b `]b `X Y b `@Y V Y b gi a gh Àb X Y b `]\ f Y f `6 Y g]h n Y f `]a H]Y f \ Y ]a ``Ub X Y b " 8 ]Y g Y `H]Y f Y `\ UV Y b `c Zh `k i b X Y f V U f Y 9][ Y b g W U Zh Y b `i b X `h f U [ Y b `Y ] b Y i b V Y g W f Y ] V `] W Y `H f Y i Y `]b `g ] W ž X]Y `g ] Y `ni `i b j Y f [ `Y ] W `] W Y b `6 Y [ `Y ] h Y f b `a U W h " `8 Y f `H]Y f g W i h n g Y h n h `g ] W `X U ZØ f `Y ] b ž `X ] Y g Y b `H]Y f Y b `Y ] b Y `nk Y ] h Y `7 \ Ub W `ni `[ Y V Y b " 8 i f W `X]Y `5 X c d h ] c b `Y ] b Y g `H]Y f Y g `k ] f X `b ] W h b i f `Y ] b Y a `@Y V Y k Y g Y b ] b `B c h `[ Y \ c `ZY b ž g c b X Y f b `[ `Y ] W n Y ] h ] [ `Ui W `D`Uhn `ZØ f `b Y i Y `H]Y f Y ] a `H]Y f \ Y ]a `[ Y g W U Z Z Y b "

9gʻ]ghʻj cbʻYbhgWkY]XYbXYfʻ6YXYi hi b[ž'XUggʻA YbgWkYbž'X]Y XUfØVYfʻbUWkXYb\_Ybž'Y]bʻ< Ui gh]YfʻUi Zni bY\a Ybž'g]WkʻXYf JYfUbhk cfhi b[ʻVYk i gghʻg]bXž'X]Yʻg]YʻØVYfbY\a Yb"ʻ8]Y 9bhgWkY]Xi b[ʻni fʻ5Xcdh]cbʻgcʻ`hYʻk c\`ØVYf`Y[hʻgY]bžʻi bXʻYgʻ]gh fUhgUa ž'g]WkʻX]YʻNY]hʻni ʻbY\a Ybž'X]Yʻf]Wkh][Yʻ, VYfY]bgh]a a i b[nk]gWkYbʻH]Yfʻi bXʻA YbgWkʻni ʻZ]bXYb"ʻ8]YgYʻ< i bXYXUa Yʻk UfhYh bi bʻgY\bgØWkh][ʻXUfUi ZžʻXUggʻYa UbXʻ]\fʻ< Yfnʻi bX']\f'Ni\Ui gY ZØfʻ]a a YfʻÒZZbYh"

DUI `Už'X]Y 'gØ» Y '< ØbX]b 'UI g'GhYbXU`ž'ghY\h'b]W\h'U``Y]b 'XU"

H]Yf\Y]a a ]hUfVY]hYf'g]bX'ghYhg'UI Z'XYf'GI W\Y'bUW\'bYI Yb

: Ua ]`]Yb 'ZØf'j YfgW\]YXYbY'H]YfY']b 'B ch" '8 U'j ]Y `Y '< i bXY'k ]Y 'DUI `U

UI g'À\b`]W\Yb'I a ghÀbXYb'k ]Y 'I a nØ[ Yb'cXYf'ZUa ]`]ÀfYb

J YfÀbXYfI b[ Yb']bg'H]Yf\Y]a '[ Y`Ub[ Ybž'V`Y]Vh'X]Y'H]Yfj Yfa ]hh`I b[

Y]bY'k ]W\h][ Y'\*\D\]h]Uh]j Y'\*\D\XYg'\D\]\f'Z]bXYb'nU\`fY]W\Y'H]YfY']a

H]Yf\Y]a 'GhYbXU`Y]b'bYI Yg'NI \UI gYž'XcW\'X]Y': `I \_hi Uh]cb']gh

\cW\Z'k Ug'X]Y'8f]b[`]W\\_Y]h'XYf'5Xcdh]cb'j YfXYI h`]W\h'

I bnà\`][ Y'<i bXY']b'XYi hgW\Yb'H]Yf\Y]a Yb'k UfhYb'Xf]b[ YbX'Ui ZY]b'bYi Yg'Ni \Ui gY"'9]bY'< YfUi gZcfXYfi b[']gh'\ài Z][ ž'XUgg'j ]Y`Y dchYbn]Y``Y'<i bXY\U`hYf'b]W\h'ØVYf'X]Y'Z]bUbn]Y``Yb'i bX Ya ch]cbU`Yb'JYfdZ]W\hi b[ Yb']bZcfa ]Yfh'g]bXž'X]Y'Y]b'<i bX'a ]h g]W\'Vf]b[ h"'8]Y'5i Z\_`\àfi b['\ØVYf'X]Y'JYfUbhk cfhi b[ ž'X]Y'a ]h'XYf 5Xcdh]cb'Y]bYg'H]YfYg'Y]b\Yf[ Y\hz']gh'XU\Yf'j cb'[ fc Yf 6YXYi hi b['

#### 6YgcbXYf\Y]hYb XYf 5Xcdh]cb

8]Y 5Xcdh]cb Y]bYg < i bXYgž ]bgVYgcbXYfY Y]bYg k ]Y DUi `Už VYb Oh][ h gcf[ ZÀ `h][ Y , VYf `Y[ i b[ Yb " 8 ]Y H]Yf\Y]a Y ZØ\fYb `c Zh \$\Delta hYfj ]Yk g a ]h \$\Delta hYfYggYbhYbž i a `g]Wk Yfni ghY ``Ybž XUgg X]Y 7\Ya ]Y nk ]gWk Yb A YbgWk i bX < i bX gh]a a h 8 UfØVYf \]bUi g Zc `[ Yb `c Zh < Ui gVYgi Wk Yž X]Y `XYf `G]Wk Yf\Y]h XYg `H]YfYg i bX `XYf bYi Yb : Ua ] `]Y `X]YbYb"

8 UgʻH]Yf\Y]a ʻGhYbXUʻžʻk ]Yʻj ]Y`YʻUbXYfYʻUi W\žʻV]YhYh I bhYfghØhni b[ʻbUW\ʻXYfʻ5Xcdh]cbʻUb"ʻGcʻ\_ÒbbYbʻbYi Yʻ6Yg]hnYf VY]ʻ: fU[YbʻcXYfʻDfcV`Ya YbʻYXYfnY]h'i a ʻF UhʻZfU[Yb"'8]Ygʻ]gh VYgcbXYfg`\]`ZfY]W\`ZØf`9fgh\ibXYVYg]hnYfž`X]Y`a Ò[`]W\YfkY]gY a ]h`i bYfk UfhYhYb`<YfUi gZcfXYfi b[Yb`\_cbZfcbh]Yfh`k YfXYb"

Ni XYa 'a ØggYb'ni \_ØbZh][Y'<i bXYVYg]hnYf'Ui W\'X]Y'Z]bUbn]Y``Y GY]hY'VYfØW\_g]W\h][Yb"'8]Y'?cghYb'ZØf': i hhYfž'H]YfUfnhVYgi W\Y i bX'UbXYfY'5i g[UVYb'\_ObbYb'g]W\'gW\bY```gi a a ]YfYb"'Gca ]h']gh Yg'k]W\h][ž'Y]bYb'fYU`]gh]gW\Yb'6i X[Yhd`Ub'Ui Zni ghY``Ybž'VYj cf a Ub'g]W\'ZØf'X]Y'5Xcdh]cb'Y]bYg'<Ui g\i bXYg'YbhgW\Y]XYh"

#### H]YfgWXihnibXJYfUbhkcfhib[

8 Yf 'H]YfgWki hn'i bX'X]Y'J YfUbhk cfhi b['ZØf'< Ui gh]YfY'g]bX']b
8 Yi hgWk 'UbX'ghUf\_'j YfUb\_Yfh'' 'H]YfgWki hn[YgYhnY'j YfdZ]WkhYb
< U`hYfž']\fY'H]YfY'Ufh[YfYWkh'ni '\U`hYb'''8]Yg'VY]b\U`hY'b]Wkh'bi f
Ui gfY]WkYbX'D`Uhnž'gcbXYfb'Ui Wk'X]Y'bÒh][Y'hÀ[`]WkY'DZY[Y'i bX
Ya ch]cbU`Y'Ni kYbXi b["'8]Y'; YgY``gWkUZh'ZØf'H]YfgWki hn'\Uh
nU\`fY]WkY'Dfc[fUa a Y']bg'@YVYb'[Yfi ZYbž'X]Y'AYbgWkYb'ØVYf'X]Y
G]WkYfghY``i b['j cb'H]YfgWki hnfYWkhYb'Ui Z\_`ÀfYb'i bX'ni f'5Xcdh]cb
Ub]a]YfYb"

Gck c\``XUg`H]Yf\Y]a 'GhYbXU``U`g`Ui W\`Y]bY`J]Y`nU\``UbXYfYf
Cf[Ub]gUh]cbYb`UfVY]hYb`XUfUbž`XUg`6Yk i gghgY]b`ZØf`X]Y`Y][YbY
JYfUbhk cfhi b['ni 'gW\ÀfZYb"'\DZcfa Uh]cbgj YfUbghU`hi b[Yb'i bX
K cf\_g\cdg`V]YhYb'dchYbn]Y``Yb'<i bXYVYg]hnYfb'k Yfhj c``Y
9]bV`]W\_Y`]b`XUg`f]W\h][Y`JYf\U`hYb'i bX`X]Y`DZY[Y'j cb'<i bXYb"

: Øf']bhYfYgg]YfhY'H]YfZfYi bXY'k ]fX'Ya dZc\`Ybž'g]W\'Ub'XUg
H]Yf\Y]a 'GhYbXU`ni 'k YbXYbž'i a 'k Y]hYfY' ±bZcfa Uh]cbYb'ØVYf
DUi `U'cXYf'X]Y'UbXYfYb'H]YfY'ni 'Yf\U`hYb"'9g'[]Vh'j]Y`Y
A Ò[`]W\\_Y]hYbž'k]Y'a Ub'\Y`ZYb'\_Ubbž'gY]'Yg'Xi fW\'X]Y'5Xcdh]cbž
DUhYbgW\UZhYb'cXYf'Ui W\'Xi fW\'GdYbXYb"

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