

Gdcfh`jWk Yf`9]bVfYWk Yf`]b`9fZi fh. `8]Y
Ui XUW]ci g`HUh`Ui Z`XYa `6U`_cb

⊕`9fZi fh`gcf[h`Y]b`gdcfh`jWk Yf`9]bVfYWk Yf`Z0f`5i ZgY\Yb.
K c\bi b[gY]bVfi Wk `a]h`8]YVghU\`j cb`6Uf[Y`X`i bX
; Y`XV0fgYb"

9]bVfi Wk `]b`9fZi fhYf`K c\bi b[.`HÅhYf`n]Y\h
a]h`@Y]Wk h][_Y]h`Y]b

9fZi fh`fbhgk

⊕`XYf`æ\UbbYgj c fghUXh`j cb`9fZi fh`\Uh`Y]b`9]bVfYWk Yf`]b`XYf
BUWk h`j cb`GUa ghU[`Ui Z`GcbbhU[`Y]b`<Y]a `VYhfYhYb`i bX`XUVY]
Y]b][Y`K YfhgUWk Yb`Yb`k Yb`XYh`8]YgYf`J cfZU``k]fZh`b]Wk h`bi f
: fU[Yb`ni f`G]Wk Yf\Y]h`]b`A Y\fZJa `]`Yb\Åi gYfb`Ui Z`gcbXYfb`nY][h
Ui Wk`ž`k]Y`k]Wk h][`Yg`]ghž`dfÅ] Yb`h]j Y`A U» bU\`a Yb`[Y[Yb
9]bVf0Wk Y`ni `Yf[fY]ZYb"

8]Y`l a ghÅbXY`XYg`9]bVfi Wk g

8Yf`HÅhYfž`XYggYb`⊗Yb`h]hÅh`V]g\Yf`i bVY`_Ubbh`]ghž`[Y`Ub[hY
ni bÅWk gh]b`XYb`⊕bYb\cZ`Y]bYg`A Y\fZJa `]`Yb\Ui gYg``8i fWk`X]Y
, VYfk]bXi b[`Y]bYg`6Ui [Yf0ghYg`gWk UZhY`Yf`Ygž`Ui Z`XYb`6U`_cb
Y]bYf`)!`Å\f][Yb`5bk c\`bYf]b`ni `_'YhhYfb``8cfh`XfUb[`Yf`0VYf`Y]b
[Y_]ddhYg`: YbghYf`]b`X]Y`K c\bi b[`Y]b``8]YgYf`9]bVfi Wk`]gh
VYgcbXYfg`VYa Yf`_Ybgk Yfhž`XU`XYf`9]bVfYWk Yf`cZZYbg]Wk h]Wk
gdcfh]Wk`k Uf`i bX`a]h`d\mg]gWk Yf`; YgWk]W_]Wk`_Y]h`U[]YfhY``9g`]gh
ni`j Yfa`i hYbž`XUgg`Yf`g]Wk`df]cf]g]Yfh`Ui Z`XUg`9]bXf]b[Yb`]b
K c\bi b[Yb`gdYn]U`]g]Yfh`\Uhž`k Ug`k Y]hYfY`G]Wk Yf\Y]hgVYXYb`_Yb
Ui Zk]fZh"

8]Y '[Yghc \`YbYb `K Yfh[Y[YbghÀbXY

⇒a `K c\bi b[g]bbYfYb`Ybhk YbXYhY`XYf`9]bVfYWX Yf`a Y\ fYfY
K YfhgUWX Ybž`XUfi bhYf`nk Y]; Y`XVÖfgYb`i bX`Yhk U`&\$\$`9i fc
6Uf[Y`X"Gc`WX`8]YVghÀ\`Y`_ÖbbYb`ZØf`X]Y`6Yhfc ZYbYb
Yf\YV`]WX`Y`dgmWX`c`c[]gWX`Y`i bX`Z]bUbn]Y`Y`Y`c`[Yb`\UVYb``8]Y
A]YhYf]b`VYa Yf`hY`Ua`GcbbhU[j cfa]hhU[`XYb`9]bVfi WX`i bX
]bZcfa]YfhY`i a [Y\YbX`X]Y`Dc`nY]ž`gcXUgg`Y]bY`gWX`bY`Y`F`YU`h]cb
YfZc`[hY"

8]Y `6YXYi hi b[`XYg`J cfZU``g`ZØf`X]Y

7ca a i b]hm

8]YgYf`J cfZU``]b`9fZi fh]gh`b]WX`h`bi f`Y]b`9]bnY`ZU``ž`gcbXYfb
gd]Y[Y`h`Y]bY`[fÖ» YfY`DfcV`Ya Uh]_`k]XYf``9]bVfØWX`Y`g]bX`i]b
i fVUbYb`; YV]YhYb`cZna U`g`Y]b`YfbghYg`DfcV`Ya ž`i bX`X]Y`6Øf[Yf
a ØggYb`ØVYf`[YY][bYhY`G]WX`Yf\Y]hga U» bU\`a Yb`i]bZcfa]Yfh
k YfXYb``9]b`ł < Ui gfUhj Yfg]WX`Yfi b[ł`_Ubb`\]YfVY]`Y]b`k]WX`h][Yg
G]WX`Yf\Y]hgbYhn`XUfghY`Ybž`YXcWX`gc`hY`Ui WX`X]Y`d\mg]gWX`Y
G]WX`Yf\Y]h`XYf`K c\bi b[Yb`Yf\`Ø\`h`k YfXYbž`i a`9]bVfØWX`Y`ni
j Yf\]bXYfb"

G]WX`Yf\Y]hga U» bU\`a Yb`i bX`DfÀj Yb]h]cb

8]Y`J YfUbhk cfh]WX`Yb`XYf`GhUX`hi bX`G]WX`Yf\Y]hgVY\`ÖfXYb`g]bX
[YZcfXYfhž`g]WX`i]bhYbg]j Yf`a]h`XYf`H\Ya Uh]_
Ui gY]bUbXYfni gYhnYb``8Uni`[Y\`Öfh`X]Y`ϕZcfa Uh]cb`XYf
6Yk c\`bYf`ØVYf`Y]bZUWX`Y`G]WX`Yf\Y]hgj cf`Y\`fi b[Ybž`k]Y`XUg
J Yff]Y[Y`b`j cb`YbghYfb`gck]Y`X]Y`ϕghU``Uh]cb`j cb`5`Ufa Ub`U[Yb
cXYf`,`VYfk UWX`i b[g`Ua YfUg``5i WX`XUg
BUWX`VUfbUWX`VUfgWX`UZhgbYhnk Yf`_`_Ubb`XUni`VY]hfU[Ybž`XUgg
j YfXÀWX`h][Y`5`_hj]h`hYb`gWX`bY`Y`Yf`[Ya Y`XYh`k YfXYb"

: Un]h

9]bVfØWX`Y`g]bX`Y]bY`F`YU`]h`hž`a]h`XYf`g]WX`j]Y`Y`Gh`XhY
Ui gY]bUbXYfgYhnYb`a ØggYb``8Yf`J cfZU``]b`XYf`ϵ\UbbYgj cfghUXh

]b`9fZ fh'nY][h'XYi h]Wk ž`k]Y`k]Wk h][`Yg`]ghž`g]Wk `U`g; Ya Y]bgWk UZh
ni gUa a Ybni gWk `]Y» Ybž`i a `Y]b`g]Wk YfYg`l a ZY`X`ni `gWk UZZYb"
8i fWk `dfÀj Ybh]j Y`A U» bU`a Yb`_ÒbbYb`6Øf[Yf`VYggYf`[YgWk Øhnh
k YfXYbž`gcXUgg`À`b`]Wk Y`J cfZÀ`Y`]b`Ni _i bZhj Yfa]YXYb`k YfXYb
_ÒbbYb"

8YhU]`g

6Ygi Wk Yb`G]Y`i bg`Ui Z.`b!U["XY