

G!:]bUbnh5@? `XYf`GdUf_UggY. `9H: g`i`bX
X]Y`Ni`_i`bZh`XYf`; Y`XUb`U[Y`]b`C`dY

9fZU\ fYb`G]Y`VY]a`G!:]bUbnh5@? `XYf`GdUf_UggY`ØVYf`9H: g
i`bX`U_hi`Y`Y`5b`U[YghfUhY[]Yb``HYfa`]bY.``"!(`"/`Ua`d/
%\$"!%%"`GYdhYa`VYf``5ba`Y`Xi`b[`cb`]bY`

⇒ `5i [i ghX]YgYg`Ť\ fYg`_Ua`Yg`Ub`XYb`:]bUbna`Āf`hYb`ni`Y]bYa
ghUf`_Yb`Hi`fVi`YbnYbž`X]Y`j`]Y`Y`ϕj`YghcfYb`j`Yfi`bg]W\YfhYb``8]YgY
l`bg]W\Yf\Y]h`k`]fX`]a`F`U\`a`Yb`XYf`b`ĀW\ghYb`J`YfUbghU`hi`b[`XYf
GdUf_UggY`5hhYbXc`fb!`@YbbYghUXh!`?`]fW\`i`bXYa`ž`XYa` `G!
:]bUbnh5@?`ž`h\Ya`Uh]g]Yfh``8]Y`HY`bY\`a`Yf`Yf\`U`hYb`X]Y
;`Y`Y[`Yb\`Y]hž`g]W\`ØVYf`XUg`j`]Y`j`YfgdfYW\YbXY`H\Ya`U`9H:
f9l`W\Ub[`Y`HfUXYX`:]`i`bXgĽ`ni`]bZc`fa`]YfYbž`Y]bYa`a`cXYfbYb
5b`U[`YgY[`a`Yb`hž`XUg`]a`a`Yf`a`Y\`f`5b`Y[`Yf`Ubn]Y\`h"

8 Ug`G!:]bUbnh5@?`Z]bXYh]b`X]YgYa`Ť\`f`ni`a`Xf]hhYb`A`U`ghUhh
i`bX`YfZFYi`h`g]W\`[`fc»`Yf`6Y`]YVh\Y]h``8]Y`J`YfUbghU`hi`b[`gfY]\Y
V]YhYh`j`]Yf`5VYbXhYfa`]bY`]b`XYb`Øfh]W\Yb`?`]bcg`Ubž`k`c`9l`dYfhYb
]\fY`?`Yb`bhb]ggY`i`bX`9fZU\`fi`b[`Yb`ni`j`YfgW\]YXYbYb`Z]bUbn]Y`Y`b
H\Ya`Yb`hY`]Yb``8Yf`YfghY`HY`]XYf`[`YbUi`Yb`8UhYb`]gh`ZØf`XYb`''`"
i`bX`(`"GYdhYa`VYf`]a`>57!`?`]bc`]b`5hhYbXc`fb`Ub[`YgYmhž`[`YZc`[`h
j`cb`k`Y]hYfYb`J`YfUbghU`hi`b[`Yb`Ua``%\$``i`bX`%"`GYdhYa`VYf`]a
@]W\hgd]Y`\`Ui`g`]b`5`hYb\`i`bXYa` ``5`Y`5VYbXY`VY[`]bbYb`i`a``%,
l`f"

9l`dYfhYb`_`ĀfYb`Ui`Z

8]Y`F`YZFYb`hYbž`XUfi`b`hYf`<`Y]bn!`Ťf[`F`Y]W\`a`Ubbž`XYf
J`c`fghUb`Xg`j`c`fg]hnYbXY`XYf`GdUf_UggY`ž`i`bX`X]Y`VY]XYb
DfcXi`_`ha`UbU[`Yf`XYf`8Y`_`6Ub`_`ž`?`Uh\`f]b`F`]Yg`i`bX`H\`ca`Ug
Dc\`a`Ubbž`ghY\`Yb`VYfY]hž`i`a`XYb`ϕ`hYfYgg]YfhYb`k`]W\h[`Y

9]bV`W_Y`]b`X]Y`K`Y`h`XYf`9H: g`ni` [YVYb`"N]Y`]gh`Ygž
[fi bX`Y[YbXY` : fU[Yb`ni` `ÀfYbž`Yhk`U`k`Y`W`Y`7`UbW`b`cXYf
F]g]_Yb`a`]h`X]YgYb` ðXYI` ZcbXg`j` YfVi` bXYb`g]bX`i` bX`k`]Y`5b`Y[Yf
X]YgY`YfZc`[fY]W`ni` f`6]`Xi` b[`]\fYf`5`hYfgj`c`fgcf[Y`bi` hnYb
_ÖbbYb"

9H: g` \UVYb`]b`XYb` `Y`h`hYb` ð\`fYb`ni` [Ybca` a` Yb`i` bX`V]YhYb`Y]bY
Yf\`Ö`hY`8]j` Yfg]Z]_Uh]cb`VY]` [`Y]W`nY]h][` [Yf]b[YfYb`?`cghYb`]a
J`Yf[`Y]W`ni` `hfUX]h]cbY`Yb` ðj` Ygha` YbhZcbXg`":` Øf`j`]Y`Y`]gh`XUg
Y]bY`UhhfU`_h]j` Y`C`dh]cbž`i` a`]b`Y]bY`J`]Y`nU` \`j` cb`l` bhYfbY`a` Yb`ni
]bj` Ygh]YfYbž`c` \bY` \c` \Y` J`Yfk`U`hi` b[g[YVØ`fYb`nU` \Yb`ni` `a` ØggYb"

8]Y`GdUf`_UggY` `ÀXh`U`Y`?`i` bXYb`i` bX`]bhYfYgg]YfhY`5b`Y[Yf`Y]bž`Ub
X]YgYf`Ui` ZgW`i` ggfY]W`Yb`J`YfUbghU`hi` b[`hY]`ni` bY`a` Yb`"l` a
g]W`Yfni` ghY`Ybž`XUgg`Y`XYf`Ui` gfY]W`YbX`D`Uhn`Z]bXYhž`]gh`Y]bY
5ba`Y`Xi` b[`YfZc`fXYf`]W`"8]YgY`_Ubb`i` b`_ca`d`]n]Yfh`ØVYf`X]Y
K`YVg]hY`XYf`GdUf`_UggY`YfZc`[Yb`/`Y]bZUW`X]Y`?`cbhU`_hXUhYb
Ui`gZ`Yb`i` bX`XYb`[Yk`ØbgW`hYb`HYfa`]b`Ui`gk`À`Yb`"6Y`k`Y]hYfYb
: fU[Yb`ghY`h`XUg`?`i` bXYbGYfj`]W`7YbhYf`XYf`GdUf`_UggY`i` bhYf`XYf
HY`YZcbbi`a` a` Yf`\$`&+`&%#`\$`*`\$`ni`f`J`YfZØ[i` b["

8]Y`J`YfUbghU`hi` b[gfY]\Y` Gl:]bUbnh5@? `k`i`fXY`&\$&&]bg`@YVYb
[Yfi`ZYbž`i`a`XYb`6Øf[Yfb`]b`XYf`FY[]cb`Y]bY`D`UhhZcfa`ZØf
Z]bUbn]Y`Y`6]`Xi` b[`ni`V]YhYb`" ð`XYb`j`Yf[Ub[YbYb` ð\`fYb`k`i`fXYb
i`bhYf`UbXYfYa`H`Ya`Yb`k`]Y`?`fmdhck`À`fi`b[Yb`cXYf
BUW` \U`h][_Y]h`VY`UbXY`h`"8]YgYg` ð\`f`Y[h`XYf` : c`_i`g`Ui`Z`9H: gž
XU`g]Y`ZØf`j`]Y`Y`5b`Y[Yf`Y]bY`]bhYfYggUbhY`A` Ò[`]W`_Y]h`XUfghY`Ybž
]\`f`J`Yfa` Ò[Yb`ni`]bj`Ygh]YfYb`i` bX`ni`j`Yfa`Y`fYb`"9g`k`]fX`VYhcbhž
XUgg`XYf` Gl:]bUbnh5@? ` _Y]bY`J`Yf`_Ui`Zgj`YfUbghU`hi` b[`]gh`<]Yf
[Y`h`Yg`df]a`À`fi`a`K`]ggYbgj`Yfa`]h`i`b[`i`bX`Y]bYb`5i`ghUi`gW
ØVYf`X]Y`j`YfgW]YXYbYb` : UW`hhYb`XYg` :]bUbna`Uf`_hYg"

:]bUb nV]`Xi` b[`ZØf`U`Y`

8]Y`6YXYi`hi` b[`j`cb`gc`]XYb`Z]bUbn]Y`Yb`?`Ybbhb]ggYb`_Ubb`b]W`h
[Ybi` [`Yfj`cf[Y`cVYb`k`YfXYbž`]bgVYgcbXYfY`]b`j`c`Uh]`Yb`NY]hYb
k`]Y`X]YgYb`"5b`Y[Yf`gY`Yb`g]W`c`Zh`a`]h`Y]bYf`J`]Y`nU` \`j` cb
 ðZcfa`Uh]cbYb`i` bX`5b[YVchYb`_cbZfcbh]Yfhž`X]Y`Yg`]\`bYb`gW`k`Yf

a UWXYbžZi bX]YfhY'9bhgWXYXi b[Yb'ni 'hfYZZYb" JcfhfÅ[Y'i bX
8]g_i gg]cbYb'k]Y'VY]a ' G!:]bUbnh5@? 'V]YhYb'Y]bY'k Yfhj c`Y
; Y`Y[Yb\Y]hž`_ca d`YI Y`H\Ya Yb'ni 'YbhgW\ØggY`b'i bX`X]fY_hj cb
: UW\`Yi hYb'ni `YfbYb"

CV'9]bghY][Yf'cXYf'YfZU\fybYf' ðj YghcfžX]Y'J YfUbgHU`hi b['f]W\hYh
g]W\`Ub'U`Yž`X]Y'\f':]bUbnk]ggYb'Yfk Y]hYfb'i bX`]`fY
5b`U[YghfUH Y[]Yb'cdh]a]YfYb'a ØW\hYb"Ni [Ub['ni 'Y]bYa 'VfY]hYb
K]ggYb`_Ubb'YbhgWXY]XYbX'gY]b'ZØf'bUW\`U'h][Yb'Z]bUbn]Y`Yb
9fZc`[žVYgcbXYfg'k Ybb'Yg'i a `X]Y'f]W\h][Yb'ðj Ygh]h]cbYb'ZØf`X]Y
Ni _i bZi[Y`h"8]Yg']gh'b]W\h'bi f`Y]b'5i Zfi Zni f`HY]'bU\`a Yž
gcbXYfb'Ui W\`Y]bY'9]b`UXi b[žXUg`Y][YbY'K]ggYb'ni 'Yfk Y]hYfb
i bX`U_hj] `]b`X]Y'dYfgØb`]W\Y':]bUbn d`Ubi b['Y]bni ghY][Yb"

8]Y':]bUbnk Y`h]gh]a a Yf`]b'6Yk Y[i b['i bX'[YfUXY`X]Y`YhnhYb
A cbUhY`nY][Ybž`k]Y'k]W\h][`Z]bUbn]Y`Y'6]Xi b['ZØf'5b`Y[Yf']gh"
8Yf'6Y[f]ZZ' 9H: `U]b`XYb`YhnhYb`U\fyb'Yf\YV`]W\`Ub
6YXYi hi b['[Yk cbbYb"9H: g'g]bX'ðj Ygha YbhZcbXgž`X]Y`Ub'6ØfgYb
[Y\`UbXY`h'k YfXYb'i bX`XYfYb`N]Y`Yg']ghž`Y]bYb'ðXYI `UVni V]`XYb"
8]YgYf'5bgUhn`V]YhYh`X]j YfgY'J cfhY`Yž`XUfi bhYf'[Yf]b[YfY'?cghYb
i bX`Y]bY'VfY]hY'8]j Yfg]Z_Uh]cb`XYf'5b`U[Yb"8Yb`bcW\`g]bX`Ui W\`
F]g]_Yb]j cf\`UbXYbž`X]Y'5b`Y[Yf'VYXYb`_Yb'gc``hYb"

8]Y'6YXYi hi b['j cb'9H: g]gh'Ui W\`j cf`XYa '<]bhYf[fi bX`XYf
6Ya Ø\i b[Yb'i a `Z]bUbn]Y`Y'6]Xi b['ni `gY\`Yb" ã a Yf'a Y\`f
A YbgWXYb'Yf`YbbYb`X]Y`B`c`k`YbX][_Y]hž`g]W\`]b`Z]bUbn]Y`Yb
5b[Y`Y[Yb\Y]hYb'k Y]hYfni V]`XYbž'i a `]bZcfa]YfhY'9bhgWXYXi b[Yb
ni 'hfYZZYb"8]Y'GdUf`UggY'5hhYbXcfb!@YbbYghUXh]?fW\`i bXYa
_ØbbhY'a]h`XYa ' G!:]bUbnh5@? 'Y]bY'k]W\h][Y'D`UhhZcfa `V]YhYbž
i a `K]ggYb'ni `hY]Yb'i bX`Ui Z`X]YgY'K Y]gY`X]Y':]bUbn`_ca dYhYbn
XYf'6Yj Ø`_Yfi b['ni `ZØfXYfb"

J YfUbgHU`hi b[gfY]\`Y'i bX`XYfYb'9bhk]W`_i b[

GY]h']\fyf'; fØbXi b['ja `U\`f`&\$&&\`Uh]g]W\`X]Y
J YfUbgHU`hi b[gfY]\`Y' G!:]bUbnh5@? `ghÅbX][`k Y]hYfYb`k]W`_Y`h
i bX`Ui Z`U`_hi Y`Y`H\Ya Yb`XYf':]bUbnk Y`h'fYU[]Yfh"8]Y`YfghYb
VY]XYb`U\`fY'k]Xa YhYb'g]W\`?fmdhck Å\fi b[Yb'i bX`bUW\`U'h][Yb

⊕j Ygh]h]cbYbž`H\Ya Ybž`X]Y`]b`XYf`² ZYbh]W\`_Y]hj]Y`X]g_i h]Yfh
k YfXYb`"8]YgY`H\Ya Yb`k UfYb`b]W\`h`bi f`hfYbXmž`gcbXYfb
gd]Y[Y`hYb`Ui W\`XUg`ni bY\`a YbXY`⊕hYfYggY`XYf`5b`Y[Yf`Ub
U`hYfbUh]j Yb`⊕j Ygha Ybhg`i bX`j YfUbhk cfhi b[gj c`Yf` ; Y`XUb`U[Y
k]XYf`"

8]Y`9bhgW\Y]Xi b[ž`b`X]YgYa `⊕\f`Ui Z`9H: g`ni `Zc_i gg]YfYbž
_ÖbbhY`XUfUi Z`\]bXYi hYbž`XUgg`X]Y`GdUf`_UggY`X]Y`ni bY\`a YbXY
F`Y`j Ubn`j cb`dUgg]j Ya `⊕j Ygh]YfYb`Yf`_Ubbh`\Uh`"@Ui h`Y]bYf
l a ZfU[Y`j cb`GhUh]ghU`\UVYb`a Y\`f`U`g`" \$i `XYf`XYi hgW\Yb
5b`Y[Yf`X]Y`5Vg]W\hž`]b`9H: g`ni `]bj Ygh]YfYbž`k Ug`Y]bY`[fc»Y
N]Y`[fi ddY`ZØf`X]YgY`J YfUbghU`hi b[gfY]\Y`XUfghY`h`"

8]Y`K]W\h][`_Y]h`XYf`Z]bUbn]Y`Yb`6]`Xi b[

:]bUbn]Y`Y`6]`Xi b[`]gh`Y]b`nYbhfU`Yg`H\Ya Už`b]W\`h`bi f`ZØf
5b`Y[Yfž`gcbXYfb`Ui W\`ZØf`X]Y`[YgUa hY` ; YgY`gW\UZh`⊕`XYf
\Yi h][Yb`NY]hž`]b`XYf`j]Y`Y`A YbgW\Yb`a]h`l bg]W\Yf\Y]hYb`Ub`XYb
:]bUbn a Äf`_hYb`_cbZfcbh]Yfh`g]bXž`]gh`Yg`j cb`YbhgW\Y]XYbXYf
6YXYi hi b[ž`XUgg`⊕j Yghc`fYb`j YfghY\Ybž`k Y`W\Y`DfcXi `_hY`]bYb
ni f`J YfZØ[i b[`ghY\Yb`i bX`k]Y`X]YgY`Zi b`_h]cb]YfYb`"K Ä`fYbX
hfUX]h]cbY`Y`5b`U[YZcfa Yb`k]Y`5`_h]Yb`i bX`5b`Y]\Yb`k Y]hYf\]b
fY`Yj Ubh`g]bXž`[Yk]bbYb`bYi Y`5bgÄhnY`k]Y`9H: g`ni bY\`a YbX`Ub
6YXYi hi b[""

8]Y`GdUf`_UggY`\Uh`g]W\`a]h`XYa `G!:]bUbnh5@? `b]W\`h`bi f`XYa
N]Y`j YfgW\f]YVYbž`\fY`?i bXYb`ni `]bZcfa]YfYbž`gcbXYfb`Ui W\`XUg
6Yk i gghgY]b`ZØf`X]Y`Bchk YbX][`_Y]h`Z]bUbn]Y`Yf`6]`Xi b[`ni
gW\ÄfZYb`"8]Y`i b`_Yb`hb]g`ØVYf` :]bUbn]bghfi a YbhY`_Ubb`ni
: Y\`YbhgW\Y]Xi b[Yb`ZØ`fYb`i bX`Y`hnh]W\`J Yfa Ö[Yb`[YZÄ`fXYb`"
A]h`9l dYfhYb`k]Y`<Y]bn! ⤵f[`F Y]W\`a Ubb`i bX`XYb`F YZYfYbhYb`j cb
8Y`_U`6Ub`_Yf\U`hYb`X]Y`HY]`bY\`a Yf`X]Y` ; Y`Y[Yb`Y]hž`]f`K]ggYb
ni `Yfk Y]hYfb`i bX`Zi bX]YfhY`9bhgW\Y]Xi b[Yb`ni `hfYZZYb`"

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