

<]Yf`]gh`X]Y`V]g\Yf][Y`F`Y]gY

7fmdhcDi b_gž`Y]bY`XYf`YfghYb`b]W`h`Zi b[]V`Yb`Hc`_Yb
fB: H!GUa a`i b[Yb`Ui Z`XYf`9h\YfYi a`!6`c`W`W`U]bž`\Uh'a]h
gY]bYa`gYW`ghYb`ǰ V]`Ai a`Y]bYb`VYXYi hYbXYb`A`Y]`YbghY]b
YffY]W`h`G`Y]h`gY]bYf`9]bZØ\fi b[`]a`ǰ b]`&\$%+` \`Uh
7fmdhcDi b_g`X]Y`K`Y`h'a]h`gY]bYb`%\$`\$\$`\$`X][]hU`Yb
GUa a`YfghØW`_Yb`]b`gY]bYb`6Ubb`[Ync[Yb`i bX`]a`B: H!
6YfY]W`U`g`[fØ» hY`B: H!GUa a`i b[`bUW`
A`Uf`_h`_Ud]hU`]g]Yfi b[`Y]bYb`i bUi g`ØgW`]W`Yb`9]bXfi W`
`]b`hYf`UggYb`"B`UW`5b[UVYb`XYg`6`c`W`W`U]b!
5bU`mgYi b`hYfbY`a`Ybg`B`UbgYb`\Uh`7fmdhcDi b_g`XYfnY]h
Y]bY`[YgW`ÅhnhY`A`Uf`_h`_Ud]hU`]g]Yfi b[`j`cb`ØVYf`, \$*`, \$%
9H<ž`k`Ug`Y]bYa`K`Yfhj`cb`a`Y`f`U`g`%ž)` `A`]]UfXYb`I`G!
8c`Uf`Yb`hgd`f]W`h`8]Y`V]g\Yf][Y`F`Y]gY`ǰ`Y]bYa`Hk`YYh!
H\`fY`UX`B`UbgYb`Yf`_`ÅfhYž`X`Ugg`7fmdhcDi b_g`Ua`i`&` "'ǰ b]`&\$%+
Y]bYb`VYgW`Y]XYbYb`5bZUb[` \`UhhYž`U`g`bi`f`&, +`K`U`Y`hg
X]Y`X][]hU`Yb`GUa a`YfghØW`_Y`/`Ua`d`^`Y`]]d/



7fmdhcDi b_gž`Y]bY`XYf`YfghYb`b]W`h`Zi b[]V`Yb`Hc`_Yb

fB: H!GUa a `i b[Yb`Ui ZXYf`9h\YfYi a !6`cW_WXU]bž`Uha`]h
gY]bYa` gYWXghYb`ž V]`Ai a`Y]bYb`VYXYi hYbXYb`A Y]`YbghY]b
YffY]WXh"

GY]higY]bYf`9]bZØ\fi b[`]a` ž b]`&\$%+` \Uh`7fmdhcDi b_g`X]Y`K`Y`h`ia`]h
gY]bYb`%\$\$\$`X][]hU`Yb`GUa a`YfghØW_Yb`]b`gY]bYb`6Ubb
[Ync[Yb`i bX`]a`B: H!6YfY]WX`U`g`[fØ» hY`B: H!GUa a`i b[`bUWX
A Uf_h_Ud]hU`]g]Yfi b[`Y]bYb`i bUi g`ØgWX`]WX`Yb`9]bXfi W_
\]bhYf`UggYb"

B UWX`5b[UVYb`XYg`6`cW_WXU]b!5bU`mgYi bhYfbY\`a`Ybg`B`UbgYb
\Uh`7fmdhcDi b_g`XYfnY]h`Y]bY`[YgWX`ÀhnhY`A Uf_h_Ud]hU`]g]Yfi b[
j`cb`ØVYf`, \$*`, \$%`9H<ž`k Ug`Y]bYa`K`Yfhj`cb`a`Y`\f`U`g`%ž)`
A]`]UfXYb`i`G!8c``Uf`Yb`hgd]f]WXh"

8]Y`V]g\Yf][Y`F`Y]gY

⇒Y]bYa`**Hk`YYh!H\`fYUX**B`UbgYb`Yf`_`ÀfhYž`XUgg`7fmdhcDi b_g`Ua
&`" `ž b]`&\$%+`Y]bYb`VYgWX`Y]XYbYb`5bZUb[` \UhhYž`U`g`bi`f`&, +
K`U`Yhg`X]Y`X][]hU`Yb`GUa a`YfghØW_Y`gcZcfh`bUWX`]\`YfY
J`Yf`ØZYb`h]WX`i b[`_c`ghYb`cg`VYUbgd`fi`WX`hYb`"8`Y`_UbUX]gWX`Yb
GcZ`hk`UfYYb`hk`]W`_Yf`A`Uhh`<U`i`bX`:`ε`\`b`K`Uh_]bgcb`V]`XYhYb`XUg
nk`Y]_`ØdZ][Y`HYUa`XYg`@Ufj`U`@UVg`Ghi`X]cgž`XUg`X]Y`?`c``Y`_h]cb`Ui`Z
XYb`A`Uf`_h`VfUWX`hY"

6]g`ni`a`9bXY`XYg`GhUfhXUhi`a`g`j`YfZØ[hYb`&-`%`Y]bn][Ufh][Y
K`U`Yhg`ØVYf`7fmdhcDi b_g`ž`bUWX`XYa`X]Y`YfghYb`5bhfU[ghY``Yf
Y]b][Y`XYf`J`Yfa`Ø[Yb`gk`YfhY`j`Yf`_`Ui`Zi`\UhhYb`"9]bY`K`cWX`Y`gd`ÀhYf
YffY]WX`hYb`X]Y`B: Hg`Y]bYb`8`i`fWX`gWX`b]hgd`fY]g`j`cb`\$ž)`9H<`VY]
Y]bYa`J`c`i`a`Yb`j`cb`%&(`9H<`"9h\Yf`k`Uf`XUa`U`g`" \$\$\$`8c``Uf`k`Yfh"

: Ugh`Y]b`ž\`f`gd`ÀhYfž`]a`5df]`&\$%, ž`Yb`h\]Y`hYb`k`Yb][Yf`U`g`) \$\$\$
Y]bn][Ufh][Y`K`U`Yhg`7fmdhcDi b_g`ž`i`bX`V]g`B`cj`Ya`VYf`&\$&\$`k`Uf
X]Y`NU\`Ui`Z`%\$\$\$`Ub[Yk`UWX`gYb`"8`Ug`K`UWX`ghi`a`_`ØbbhY`a`]h
XYa`5i`Z`_ca`a`Yb`j`cb`K`fUddYX`Di b_g`]a`GYdhYa`VYf`&\$&\$
ni`gUa`a`Yb`\`Àb[Yb"

J`YfdUW`_hY`Di b_g`g]bX`9F`7!`+`&%!`B: Hgž`X]Y`Xi`fWX`icf][]bU`Y

9F 7!&\$!Di b_g'i bhYfghØhnh'k YfXYb'i bX'Ui Z'A Uf_hd`ÀhnYb'k]Y
C dYbGYU'i bX'F Uf]V`Y` \UbXY`VUf'g]bX"6]g\Yf'g]bX'bcW`'++\$
Di b_g'j YfdUW_hž'i bX'XYf'J YfhfU[']gh'XYf'[fØ» hY`Di b_!`b\UVYfž
[YZc`[hj ca`B: H!I bhYfbY\`a Yb'M [U`@UVg'a]h'(&&Di b_g"

8]Y`hYi YfghY`7 fmdhc Di b_!HfUbgU_h]cb

⇒ `ſ\f'&\$&%`gh]Y[`XYf'K Yfhj cb`7 fmdhcDi b_g'ni gUa`a Yb'a]h'XYf
NU\`bYi Yf'GUa`a`Yf'fUgUbh'Ub"K`À\fybX'X]Y`5bnU\`XYf
; Y`XVØfgYb'a]h'a]bXYghYbg'Y]bYa`Di b_`*`-`'YffY]W`hYž'gh]Y[Yb
X]Y`DfY]gY`ZØf'GUa`a`YfghØW_Yž]bgVYgcbXYfY`ZØf'gc`W`Y'a]h
gY`hYbYb`5hhf]Vi hYb'k]Y`5`Y]b'i bX`5ZYž'gd fi b[\UZh'Ub"

6]g'ni a`%, "': YVfi Uf'&\$&%`YffY]W`hY`7 fmdhcDi b_g'Y]b
k ØW`Ybh]W`Yg'Jc`i a`Yb'j cb'&("`-`*`-`9H<`f(,`'A]``cbYb`i G!8c`UfŁ`
5a`gY`VYb`HU[`k`i`fXY`Di b_`. (%) *`ZØf`*) \$`9H<`f%ž&)`'A]``cbYb
8c`UfŁ`j Yf_Ui Zhž`k Ug`XUg`YfghY`A U`k Ufž`XUgg`Y]b`GUa`a`YfghØW_
ZØf`a`Y\`f`U`g`Y]b`Y`A]``cb`8c`Uf`j Yf_Ui Zh`k`i`fXY"

8]Y`Ui » Yf[Yk Ø\`b`]W`ghY`7 fmdhcDi b_!HfUbgU_h]cb`ZUbX`Y]b`ſ\f
gd`ÀhYf`ghU`hž`U`g`Di b_`.) , &&ZØf`, "\$\$\$`9H<`f&`ž+`A]``cbYb`i G!
8c`UfŁ`j Yf_Ui Zh`k`i`fXYž`k Ug`]b`ni a`V]g`Ub[`hYi YfghYb`Di b_
a`UW`hY"

M [U`@UVg`j YfØZZYb`h`]W`h`7 fmdhc Di b_g!6i W`

5b`Àgg`]W`XYg`gYW`ghYb`š`V]`Ài`a`g`\Uh'g]W`M [U`@UVgž`XYf
9][YbhØa`Yf`j`cb`7 fmdhcDi b_gž'a]h'XYf`NU_`; fci`d
ni`gUa`a`Yb[YhUbž'i a`X]Y`cZZ]n]Y`Y`8c`_i a`YbhUh]cb`XYf`B: H!
GUa`a`i`b[`]b`Y]bYa`Y]bn][Ufh][Yb`6i W`ni`j`YfØZZYb`h`]W`Yb"

8Yf`?UhU`c[`k`]fX`X]Y`i`bYfn`À`hYb`; YgW`]W`hYb`XYf`GUa`a`i`b[
ni`a`@VYb`Yfk`YW_Yb`i`bX`YXYb`Di b_`D]I`Y`ZØf`D]I`Y`XYhU]``Yfh
VYgW`fY]VYb"

...

6Ygi W\Yb`G]Y`i bg`Ui Z.`_fmdhc!bYk g"Uh