A YbgU!DfY]gYf\Ò\i b[]b`@Y]dn][. `K Ug
Ghi X]YfYbXY`k ]ggYb`a ØggYb

5V`5i [ i gh`Yf\Ò\h`XUg`@Y]dn][Yf`Ghi XYbhYbk Yf`_`X]Y
A YbgUdfY]gY`k Y[ Yb`ϕZUh]cb" `5i gbU\`a Yb`[ Y`hYb`ZØf
Ghi X]YfYbXY"

DfY]gYf\Ò\i b[]b`@Y]dn][ Yf`A YbgYb.`9]bY
< YfUi gZcfXYfi b[`ZØf`Ghi X]YfYbXY

8]Y`[ Yd`UbhY`9f\Ò\i b[ `XYf`9ggYbgdfY]gY`ja `@Y]dn][Yf
Ghi XYbhYbk Yf`\_`UV`5i [ i gh`k]fZh: fU[Yb`ØVYf`X]Y`Z]bUbn]Y`Y
6Y`Ughi b[ `XYf`Ghi X]YfYbXYb`i bX`X]Y`5i gk]f`\_i b[ Yb`Ui ZX]Y`c`_U`Y
; Ya Y]bgW`UZh`Ui Z"

@Y]dn][" `8 Ug`Ghi XYbhYbk Yf`\_`@Y]dn][`k ]fX`ni a `%"`5i [i gh`X]Y
DfY]gY`ZØf`A U\`nY]hYb`]b`gY]bYb`A YbgYb`i bX`7 UZYhYf]Yb`Ub\`YVYb"
8]YgY`9bhgW`Y]Xi b[`YfZc`[h`bUW`Y]bYf`Ub[ Yb`D\`UgY`XYf
GhUV]`h`h`b`XYb`DfY]gYb`i bX`k ]fX`VYX]b[h`Xi fW`X]Y`Ub\`U`hYbXYb
ϕZUh]cbghYbXYbnYbž`X]Y`Ui W`j cf`ghi XYbh]gW`Yb`9]bf]W`hi b[Yb
b]W`h`\`U`h`a UW`Yb"

:]bUbn]Y`Y`6Y`Ughi b[ `ZØf`Ghi X]YfYbXY

8]Y`9f\Ò\i b[ `k]fX`ZØf`Ghi X]YfYbXYž`A ]hUfVY]hYbXY`XYf
<cW`gW`i `Yb`i bX`6Ygi W`Yf`XYf`l b]j Yfg]h`h`gdØfVUfY
5i gk]f`\_i b[ Yb`\`UVYb" `K `À\`fYbX`X]Y`DfY]gY`ZØf`5b[YghY`hY`i bX
; `ghY`nk]gW`Yb`%\$`7Yb`h`i bX`%ž&\$`9i fc`ghY][Ybž`V`Y]Vh`X]Y
DfY]gghY][Yfi b[`ZØf`Ghi X]YfYbXY`gY`Y`\_h]j " `<]Yf`g]bX`bi f
VYgh]a a hY` ; Yf]W`hY`VYhfc`ZZYbž`XUfi bhYf`VY`]YVhY`C`dh]cbYb`k]Y
?ØhVi `Uf`a]h`GØ`_Ufhc`ZZ`dØfY`Y`cXYf`D]nnUž`X]Y`\_ØbZh][ `i a `%\$
V]g`+ ) `7Yb`h`hYi fYf`k YfXYb" `8]YgY`gW`f]h`k Y]gY`DfY]gUbdUggi b[

_ÖbbhY`YXcW`XUg`6i X[ Yhj ]Y`Yf`Ghi X]YfYbXYf`VY`UghYbž`X]Y
VYfY]hg`j cb`UbXYfYb`@YVYbg`U`hi b[ g\_cghYb`VYhfcZYb`g]bX"

G]hi Uh]c b`]b`XYf`F Y[]cb

⇒a ; Y[YbgUhn`ni f`DfY]gYf\`Ö`i b[`]b`@Y]dn][` \ UVYb`UbXYfY
g`ÄW`g]gW`Y`Ghi XYbhYbk Yf`\_Yž`k]Y`X]Y`]b`8fYgXYb`i bX`7`Y`a b]hnž
V]g`Yf`_Y]bY`DfY]gUbdUggi b[ Yb`Ub[Y`\_ØbX][ h`8]YgY
i bhYfgW`]YX`]W`k ]f`_YbXYb`DfY]gghfUHY[ ]Yb`k YfZYb`Y]b`@]W`h`Ui Z
X]Y`Z]bUbn]Y`Yb`<YfUi gZcfXYfi b[ Ybž`a]h`XYbYb
6]`Xi b[ gY]bf]W`hi b[Yb`\_cbZfcbh]Yfh`g]bX" `ϕ`Y]bYf`NY]hž`]b`XYf
j]Y`Y`Ghi X]YfYbXY`Ui Z]\`f`6i X[ Yh`UW`hYb`a ØggYbž`\_ÖbbhY`X]Y
@Y]dn][Yf`9bHgW`Y]Xi b[`U`g`i bUb[ Ya`YggYb`Ya`dZ`bXYb`k YfXYb"

8]Y`F Y`Yj Un`XYf`9bHgW`Y]Xi b[

8]Y`9bHgW`Y]Xi b[`XYg`Ghi XYbhYbk Yf`\_g`]gh`VYgcbXYfg`k]W`h][ ž`XU
g]Y`b]W`h`bi f`X]Y`NU`i b[gVYfY]hgW`UZh`XYf`Ghi X]YfYbXYb`]b` : fU[Y
ghY`hž`gcbXYfb`Ui W`Y]b`[ fÖ» YfYg`6]`X`XYf`k ]fhgW`UZh]W`Yb`@U[Y
]b`8Yi hgW`UbX`k ]XYfgd]Y[ Y`h`8 ]Y`ϕZUh]cb`k ]f`_h`g]W`ni bY`a`YbX
Ui ZXUg`hÄ[ `]W`Y`@YVYb`Ui gž`k Ug`j ]Y`Y`]b`XYf` ; Ya`Y]bgW`UZh
VYhf]Z]h`Ni XYa`_ÖbbhY`X]YgY`DfY]gghY][Yfi b[`X]Y`5hhfU`hj ]hÄh`XYf
A YbgU`U`g`\_cghYb[ Øbgh][ Y`J`YfdZY[ i b[ gcdh]cb`a`]bXYfb"

: Un]h

8]Y`9f\`Ö`i b[ `XYf`A YbgUdfY]gY`]b`@Y]dn][ `UV`5i [ i gh`]gh`Y]bY`_`UfY
FYU`\_h]cb`Ui Z`k ]fhgW`UZh]W`Y`<YfUi gZcfXYfi b[Yb`"G]Y`j YfXYi h`]W`h
YXcW`Ui W`ž`k ]Y`k]W`h][ `Yg`]ghž`Y]bY`6U`UbW`nk ]gW`Yb`XYb
Z]bUbn]Y`Yb`6YXØfZb]ggYb`j cb`6]`Xi b[ gY]bf]W`hi b[Yb`i bX`XYb
A Ö[`]W`_Y]hYb`XYf`Ghi X]YfYbXYb`Yfni ghY`Yb" `ϕ`Y]bYf`NY]hž`]b
XYf`Z]bUbn]Y`Y`6Y`Ub[Y`]a`a`Yf`XfÄb[YbXYf`k YfXYbž`V`Y]Vh
UVni k UfhYbž`k ]Y`g]W`X]YgY`A`U» bU`a`Y`Ui ZX]Y`9gg[ Yk`c`b`Y]hYb
i bX`XUg`K`c`VY]bXYb`XYf`Ghi X]YfYbXYb`Ui gk ]f`_Yb`k]fX"

· · B 5;

8YhU]g

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