

UbX`gUZYImYYI Ua]bUHjcb`dfcWYXi fYg/gdYW]U``Wcbg]XYfUHjcb`]b`H\Y`Yj YbhcZ]``bYgg`cf`a]gUXj YbH fY/ ghi XYbhYei]lmiUbX`X]gUV]`]lmy'UbX`ch\Yf`YggYbHjU``UWUXYa]W]bZcfa UHjcbž gYY`<u>\hdg.##k k k "Ufhg"i bgk "YXi "Ui #W ffYbHghi XYbhg#UWUXYa]W]bZcfa UHjcb#dfchcWc`g![i]XY`]bYg#</u>

7ci fqY^{*}8YHJ^{*}q

7 fYX]hDc]bhg ***

E fqV/We

Gi a a UfmcZhXY7ci fqY

HYUWX]b[GhfUhY[]Yg

GiVYWhi5fYU.1 a WieS`V9WVWdEfqV[Me

H\]q'Wci fqY'WUb'U`qc'VY'qhi X]YX']b'h\Y'Zc``ck]b['gdYW]U`]gUh]cbg. '3e[S` EfgV[Wel : [efackl <SbS` WeW

H\]q"Wci fqY"cZZYfq"U"h\Ya UhWcj Yfj]Yk "cZ>UdUbYqY"\]qhcfmiZfca "dfY\]qhcfmihc"h\Y"A Y]/["=a dYf]U"

fY`][]cbždYUgUbhfYVY``]cbžWcaacbYffYg]gHUbWYžUbX'UgdYWgcZdcdi`UfW`hfY"'

5 hih Y WebWi g]eb cZih]g Wei fgY h Y ghi XYbhik]``VY UV Y he

%" 8Ya cbghfUhY _bck `YX[Y cZh\Y \]ghcfmcZdfYa cXYfb >UdUb"

("=XYbhZmi YmXYVUhYq'UbX'WcbWYdhq']b'dfYa cXYfb'>UdUbYqY'\]qhcfm"

FYqhcfUhlcb'cZ% *, žilhq'WYbhfU`'h\YaY'VY]b['h\Y'\]qhcfmcZk caYbž'[YbXYf'UbX'qYI i U`]hlYq"'5q'h\Y'Wci fqY]q'YqqYbHU``mU'W `h fU``UbX'gcWU``\]ghcfmžmci 'k]``bchcb`mX]gW gg'h\Y']XYUg'UbX'gcWU`'dfUWfWg'cZ fi `]b['WUggYg`fWj]``Uf]ghcWfUhg`UbX`h\Yb`Vi g\]# Uff]cfgŁžVi hik]```U`gc`YI Ua]bY`dcdi `Uf`6i XX\]ga žZc`_

&" 5bU`mqY'dfYa cXYfb`>UdUbYqY'<]ahcfmih\fci [\'h\Y`Yba'cZ[YbXYf'UbX'ZYa]b]ahaW\c`Ufa\]d" ' " 7 cbgłfi WiUf[i a Ybłą UVci hdfYa cXYfb >UdUbYgY <]głcfm]b k f]łłłYb UbX#cf j YfVU Zcfa

H\]g'Wci fgY']bhfcXi Wyg'gh XYbhg'hc'_YmXYVUhyg'UVci hih\Y'YUf'ma cXYfb'\]ghcfmcZ>UdUbžk]h. Ub Ya d∖Uq]qʻcbʻk ca YbfqʻUbXʻ[YbXYf`\]qhcfm" ≢ni qYqʻYWni fYqʻhc hYUW. WobhYbhzʻUbXʻhi hcf]U`qʻhc U``ck ghi XYbhg hc X]gW gg h Y]f fYUX]b["Hi hc f]U``UggYgga Ybhg UfY XYq][bYX Vch hc YbWci fU[Y ahYUXm Yb[U[Ya YbhfdUfh]WdUh]cbEUbX hc UXX XYdh hc h hcf]U`X]gW gg]cb f&l fYgdcbgYgžd`i g X]gW gg]cb ei Yqhlcbqt""H\Y`fYqYUfWX`dfcYWfi\Y`dq`qh XYbhq`hc`i bXYfhU_Y`qhfi Wfi fYXž`]bXYdYbXYbhfYqYUfWX"

) "@cWUHY`UbX`UbU`mqY`df]a UfmUbX#cf`qYWcbXUfma UHYf]U``fY`Yj Ubhirc`dfYa cXYfb`>UdUbYqY`\]qhcfm"

fYgYUfWX 'ei Ygh]cbŁ'UbX'U'%\$\$!k cfX'WcbWi g]cb'fk \YfY'mci 'k]``fY]hYfUhY'h\Y'Ubgk Yf'hc'mci f'ei Ygh]cb'UbX dfcj]XY'U'Vf]YZgi a a UfmcZmci f'fYgYUfWXŁ''5``gci fWrg'i gYX'a i ghVY'Zfca 'Y]h\Yf'dYYf!fYj]Yk YX'ci fbU'g cf'WXUdhYfg'Zfca 'YX]hYX'Vcc_'Wc``YWf]cbg'': YYXVUW_'k]``VY'[]j Yb'hc'mci 'k]h\']bX]j]Xi U``Wca a Ybhg'j]U ; fUXYa Uf_'cb'Hi fb]h]bž']b'UXX]h]cb'hc'U'ei U`]hUh]j Y'[fUX]b['fi Vf]W

Hi fb]h]b`gYh]b[.`H\]g`Ugg][ba Ybh]g`gi Va]hYX`h\fci [\`Hi fb]h]b`UbX`ghi XYbhg`Xc`bchgYY`Hi fb]h]b g]a]`Uf]hmifYdcfhg"

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

Ghi XYbhg UfY YI dYWYX hc di hh\Y]f bUa Yg UbX ghi XYbhbi a VYfg cb Yj YfmdU[Y cZh\Y]f Ugg][ba Ybhg"

Hi fb]h]b Gi Va]gg]cb

Zmci YbWci bhYf'U'dfcV'Ya 'k \Yb'UthYa dhjb['hc'gi Va]hmci f'Ugg][ba Ybht\fci [\'Hi fb]hjbž'd'YUgY hY'Yd\cbY'9I hYfbU''Gi ddcfhicb'-',) '' ' %cf'Ya U]`'h\Ya 'cb'<u>YI hYfbU'hY'hgi ddcfh4 i bgk "YXi "Ui</u>"'Gi ddcfh \ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY_XUmg'UbX'-.\$\$Ua '-') .\$\$da 'cb'k YY_YbXg'fl *) 'XUmg'U'mYUfŁ'' Zmci UfY'i bUV'Y'hc'gi Va]hmci f'Ugg][ba YbhXi Y'hc'U'ZJi `hk]h\'Hi fb]hjb'mci 'a UmUdd`m'Zcf'Ub'YI hYbg]cbžVi hmci a i ghfYhU]b'mci f'hjW_Yhbi a VYf'Zfca '9I hYfbU''Gi ddcfhfU'cb['k]h\ 'Ubmch\Yf'fY'Yj UbhXcW a YbhgŁ'hc]bWi XY'Ug'Yj]XYbWY hc'gi ddcfhimci f'YI hYbg]cb'Udd`]WUhjcb'' Zmci 'Ya U]`'9I hYfbU''Gi ddcfhimci 'k]`` Ui hca UhjWU'`mfYWY]j Y'U'hjW_Yhbi a VYfž'Vi h]Zmci 'hY'Yd\cbY'mci 'k]``bYYX'hc'gdYWJZWU'`mUg_'Zcf'cbY" Hi fb]hjb'U`gc'dfcj]XYg'i dXUhYg'cb'h\Y]f'gmghYa 'gfUh g'cb'Hk]hYf"

; YbYfU``mž'UggYgga YbhiHUg_g'a i ghVY'gi Va]HHXXYYWYfcb]WU``mj]U'Y]H\Yf'Hi fb]h]b'cf'U'A ccX`Y Ugg][ba Ybh''=b`]bgHUbWYg'k \YfY'H\]g']g'bchdcgg]V`Yž']hk]``VY'gHUHX'cb'mci f'Wci fgY'g'A ccX`Y'g]HY'k]H\ U`HYfbUh]j Y'gi Va]gg]cb'XYHU]`g''

@UhY 5ggYgga Ybh DYbU`h]Yg

5b'UggYggYX'HJg_']g'XYYa YX``UHY']Z]h']g'gi Va]HHYX'UZHYF'H\Y'gdYW]ZJYX'Hja Y'UbX'XUHY'Ug'gYhici h]b'H\Y Wci fgY'@YUfb]b['A UbU[Ya YbhGmgHYa 'f@A GŁ''

H\Y``UHY`dYbU`hm`]g`H\Y`cgg`cZ)ı `cZH\Y`hcHJ``dcgg]V`Y`a Uf_g`Zcf`H\Y`HUg_`Zcf`YUWX`XUmcf`dUfhiH\YfYcZH\Y k cf_`]g``UHY"`@UHYbYgg`k]```]bWi XY`k YY_YbXg`UbX`di V`]W\c`]XUmg"`H\]g`XcYg`bchUdd`mhc`U`HUg_`H\Uh`]g UggYggYX`Vi hibc`a Uf_`]g`Uk UfXYX"

K cf_'gi Va]httX:Zci fhtYb`f%(EXUmg`UZhYf`h\Y`Xi Y`XUhY`k]``VY`a Uf_YX`UbX`ZYYXVUW_`dfcj]XYX`Vi hbc`a Uf_ k]``VY`fYWcfXYX''`=Zh\Y`k cf_`k ci `X`\Uj Y`fYWY]j YX`U`dUgg`a Uf_`Vi hZcf`h\Y``UhYbYgg`UbX`h\Y`k cf_`]g`U Wca di `gcfmWci fgY`Wca dcbYbhzU`gh XYbhk]``VY`XYYa YX`hc`\Uj Y`a Yhh\UhfYei]fYa Ybh'`H\]g`XcYg`bch Udd`mhc`U`hUg_`h\Uhi]g`UggYggYX`Vi hbc`a Uf_`]g`Uk UfXYX''

K cf_`gi Va]hhYX'hk YbhnicbY'f&&:XUmg'UZhYf'h\Y'Xi Y'XUhY'k]``bch'VY'UWW/dhYX'Zcf'a Uf_]b['cf'ZYYXVUW_ UbX'k]``fYWY]j Y'bc'a Uf_`cf'[fUXY"'=Zh\Y'UggYgga Ybh'hUg_`]g'U'Wca di `gcfm'Wca dcbYbhicZh\Y'Wci fgY'U ghi XYbh'k]``Ui hca Uh]WU``m'ZU]``h\Y'Wci fgY"

GdYWJU``7cbg]XYfUh]cb`5dd`]WUh]cbg

 $\label{eq:milling} \end{tabular} Mci `WUb`Udd`millingYgdYWJU`Wcbg]XYfUh]cb`k \Yb`]``bYgg`cf`ch\Yf`WJfW a ghUbWfg`]bhYfZYfY`k]h\`mci f UggYgga YbhidYfZcfa UbWf"$

G]W_bYggža]gUXjYbhifY`cf`ch\Yf`W]fW a gHubWfg`VYmcbX`mcif`Wcbhfc``aUm

ł DfYj Ybhmci Zfca Wcad Yhjb[UWci fgY fYei]fYa Ybhž

ł?YYdimci Zfca UHYbX]b[UbiUggYggUVYUW]j]mž

ł Ghod moi i gi Va]hh]b[iUggYggUV Y k cf_ Zcf U Wci fgYž

ł `G][b]Z]WUbhmUZYWimci f`dYfZcfa UbWi`]b`UggYggUV`Y`k cf_ž`VY`]hU`Zcfa U``YbX!cZigYa YghYf`YI Ua]bUh]cbž`U WUgg`hYghž`U``UVcfUhcfmhYghž`U`gYa]bUf`dfYgYbhUh]cb`cf`Ubmich\Yf`Zcfa `cZUggYgga Ybh'

: cf'Z fh\Yf'XYHJ]`g`]b`fY`UH]cb`rc`GdYW]U``7 cbg]XYfUH]cb`]bWi X]b[`''K \Yb`rc`5dd`mf'Z''<ck`rc`5dd`mf'UbX "Gi ddcfh]b[`8cW a YbHJh]cb"'d`YUgY`fYZYf'rc'h\Y`GdYW]U``7 cbg]XYfUH]cb`rk YVgh]Y.` \hhdg.##gh XYbH'i bgk "YXi "Ui #gdYW]U`!Wcbg]XYfUH]cb

5WUXYa]W<cbYghmUbX D`U[]Uf]ga

D`U[]Uf]ga `]g`i g]b[`h\Y`k cfXg`cf`]XYUg`cZch\Yfg`UbX`dfYgYbh]b[`h\Ya `Ug`mci f`ck b"`=hWUb`hU_Y`a Ubm Zcfa gžZca `XY`]VYfUhY`W\YUh]b[`hc`UWW]XYbhU``mWcdm]b[`Zca `U`gci fWY`k]h\ci hUW_bck `YX[Ya Ybh'

I BGK '[fci dg'd`U[]Uf]ga ']bhc 'h\Y'Zc``ck]b['WUhY[cf]Yg.

7 cdm]b[..i g]b['h\Y`gUa Y`cf`j Yfmig]a]`Uf`k cfXg`hc`h\Y`cf][]bU``hYI h`cf`]XYU`k]h\ci h`UW_bck`YX[]b['h\Y gci fWY`cf`i g]b['ei chUh]cb`a Uf_g"`H\]g`U`gc`Udd`]Yg`hc`]a U[Ygž`Ufh`UbX`XYg][b`dfc`YWhgž`Ug`k Y```Ug dfYgYbhUh]cbg`k \YfY`gca YcbY`dfYgYbhg`Ubch\Yf'g`]XYUg`cf`k cfXg`k]h\ci h`WfYX]h"

=bUddfcdf]UhY'dUfUd\fUg]b[.'W\Ub[]b['U'ZYk 'k cfXg'UbX'd\fUgYg'k \]Y'a cghmfYhU]b]b['h\Y'cf][]bU' ghfi Whi fY'UbX']bZcfa Uh]cb'k]h\ci hUW_bck `YX[Ya Ybh''H\]g'U`gc'Udd`]Yg']b'dfYgYbHUh]cbg'k \YfY'gca YcbY dUfUd\fUgYg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci hWfYX]h''=hU`gc'Udd`]Yg'hc'd]YW]b['hc[Yh\Yf'ei chYg'UbX dUfUd\fUgYg']bhc'U'bYk 'k \c`Yž'k]h\ci hfYZYfYbW]b['UbX'U'gh XYbhg'ck b'UbU`mg]g'hc'Vf]b['h\Y'a UhYf]U` hc[Yh\Yf''

7 c``i g]cb. 'k cf_]b['k]h 'ch Yfg'Vi hdUgg]b['cZh Y'k cf_'Ug'U'dYfgcb'g']bX]j]Xi U``k cf_''7 c``i g]cb'U`gc]bWi XYg'dfcj]X]b['mci f`k cf_'hc'Ubch Yf'gh XYbhVYZcfY'h Y'Xi Y'XUhYzcf'Zcf'h Y'di fdcgY'cZh Ya d`U[]Uf]g]b['UhUbmh]a Yž'dUm]b['Ubch Yf'dYfgcb'hc'dYfZcfa 'Ub'UWUXYa]WhUg_ž'ghYU`]b['cf'UWei]f]b[Ubch Yf'dYfgcb'g'UWUXYa]Wk cf_'UbX'Wcdm]b[']hz'cZYf]b['hc'Wca d`YhY'Ubch Yf'dYfgcb'g'k cf_'cf'gYY_]b[dUma YbhZcf'Wca d`Yh]b['UWUXYa]Wk cf_''

=ÐUddfcdf]UhY`W]hUh]cb. 7]h]b[`gci fWYg`k∖]WX`\Uj Y`bchVYYb`fYUXžk]h\ci hUW_bck`YX[]b[`h\Y`″gYWcbXUfm´ gci fWY`Zfca`k∖]W\`_bck`YX[Y`cZh\Ya`\Ug`VYYb`cVhU]bYX"

8id`]\WUh]cb`fl`gY`ZId`U[]Uf]ga "Ł`gi Va]hhjb[`mcif`ckb`kcf_ž`]b`k\c`Y`cf`]b`dUfhž`k\YfY`]h\Ug`dfYj]cig`m VYYb`dfYdUfYX`cf`gi Va]hhYX`Zcf`Ubch\Yf`UggYggaYbhcf`\\circf`Ucil BGK `cf`Ubch\Yf`ib]jYfg]hm"

7 cffYWhfYZYfYbW]b[dfUWf]WYg.

• VYHYfa UbU[Y'mcifh]a Y

F Ygci fWg

DfYgWf]VYX F Ygci fWfg

BchUjU]`UV`Y

FYWca a YbXYX FYgci fWYg

5bbY'K U'N U``ž <SbS`, 3 5g/fgdS † Ea
U[S † S` V Ba (ff[US^: [efackl:6cghcb:UbX'BYk: Mcf_ž < ci [\hcb'A]Z]b
7 ca dUbnž &\$\$*

7 cbfUX Hcha Ubž <SbS 4 WadWB Wolk, 3 E Zadf: [efack + I b] j Yfg]mic Z 7 U]Zcfb]U Df Yggž %-, %

?YbbYh\`; "`<Ybg\U``ž`3 : [efack aX<SbS` , 8da_ E fa` W3YWfa E gbWdbai Wd < Ua dg\]fY`UbX`@cbXcbž A UWa]``Ubž% - - "

FZW5S_TdVYW: [efack aX<SbS` žJ c`i a Yg`%—) ž@cbXcbžBYk `Mcf_`UbX`A Y`Vci fbYž7Ua Vf]X[Y I b]j Yfg]mDfYgg"`%,, -%---

DYHYf8iigž8WgVS1e_ [<SbS`+BYk Wcf_ž?bcdZz% *-"

>c\b'K "'<U``ž'<SbS`, 8da_ BdWZ[efack fa ? aVWd F[_Wel 8Y`UWcffYž'% +\$"

9Xk]b°C"°FY]gVXUiYf7'5`VYfhA"°7fU][ž<SbS`, FdSV[f[a`S`VFdS`eXad_Sf[a`ł5``Yb7'1 bk]bž%, ffYj]gYX°YX"Ł"

K "'GWchiA cfhcbž <SbS`, ;fe : [efack S` V 5g /fgdW A W fUk ! <]``'ŧ)Wž % - ("

7 ci fgY 9j U`i Uh]cb UbX 8Yj Y`cda Ybh

7 ci fgYgʻUfYʻdYf]cX]WU``mfYj]Yk YXʻUbXʻgh XYbhgʻZYYXVUW_`]gʻi gYXʻhcʻ]a dfcj Yʻh\Ya "`: YYXVUW_`]g [Uh\YfYX`Zfca `gh XYbhgʻi g]b[`a m91 dYf]YbW"`+i]gʻYbWci fU[YX`gh XYbhgʻWca d`YhYʻh\Y]f`gi fj YmgʻVm UVWYgg]b[`h\Y`dYfgcbU`]gYX`k YV``]b_`j]Uʻh\Y`A ccX`Y`Wci fgY`g]hY"

⊣a U[Y[·]7fYX]h

\htdg.#Mcaacbg"k]_]aYX]U"cf[#]_]#]Y.K caYbi &+gS5Whjj]hjYgScZ5h\YSHc_i [UkUS9fU!S7fYUhjb[S6cb_ Y]SHfUnS@UbXgWUdYgS@57A5S57%-, "&') "%"%1"" "位[

7F=7CG

7F=7CG`Dfcj]XYf`7cXY.`\$\$\$-,;