

MDIA3006

DfcXi Wgcb Gh X]c

GYa YghYf'Hk c''#'&\$%

7ci fgY Cj Yfj]Yk

GHJZZ7cbHJWh8YHJ]`q

7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`] m	@cWUh]cb	D\cbY
5`mggU'Fch\kY``	\square	6mYa U]` Uddc]bha Ybh'	' ‰ 'K YVghYf 6i]`X]b[-',)*,\$+

GW.cc`7cbhJWh =bZcfa Uhlcb

Fcca " %&ž"Yj Y" FcVYfhK YVqhYf'6i]X]b[

D\cbY. f\$&Ł'-',) '(,)*

9a U]`. 'gUa 4 i bgk "YXi "Ui

K YVq]hY. \hada.#qUa "Ufhq"i bgk "YXi "Ui_

H\Y'GW\cc``cZh\Y'5fhg'UbX'A YX]U'k ci `X'`]_Y'hc'F YgdYWMZ ``m'5W_bck `YX[Y'h\Y'HfUX]h]cbU``7i qhcX]Ubqž h\Y'6YXY[U`fPYbq]b[hcb'WJa di qŁž; UX][U`f7]hmUbX'5fh/ '8Yq][b'7Ua di qYqŁ'UbX'h\Y'B[i bbUk U` dYcdYffuEcZh\Y "UbXgk\YfYYUW\ WJa digcZl BGK]g `cWJhYX"

5 h Y b X U b W F Y e i] f Y a Y b h g

5 qh XYbh]q Yl dYWYX hc UhYbX U``WUqq WcbhUWi\ci fq Zcf U ZUW!hc! ZUW! fl & L'cf V YbXYX Wci fqY UbX Wca d`YhY'U```UWhjj]hjYg'Zcf'U'V`YbXYX'cf'Zl ``micb`]bY'Wci fgY"

5 'ghi XYbhik \c'Uff]j Yg'a cfY'h\Ub'%) 'a]bi hYg'`UhY'a UmVY'dYbU`]gYX'Zcf'bcb!UhhYbXUbWY'''⊋qi W\'U'dYbU`hm]g^]a dcgYXžh\Y^gh XYbha i ghVY^]bZcfa YX^j YfVU``mUhh\Y^YbX`cZWUgg^UbX`UXj]gYX^]b^k f]h|b[^k]h\]b^&(\ci fg"

ZUʻqh XYbhYl dYf[YbWYq']`bYqqža]qUXj Ybh fYʻcfʻch\YfʻcVW ffYbW h\Uha U_YqʻUVqYbW Zfca ʻU Wugg#JWnjj]mmi buj c]XUV`Yžcf`Yl dYWng hc VY`UVgYbhZfca `U`Zcfh\Wca]b[`Wugg#JWnjj]mmzh\Ymg\ci `X`gYY_ dYfa]gg]cb Zfca 'h\Y'7 ci fgY'5i h\cf]mž'UbX'k \YfY'Udd`]WUV`Yž'h\Y]f'fYei Yghg\ci `X'VY'UWWca dUb]YX'VmUb cf][]bU`cf`WfflZYX`WcdmcZU'a YX]WU`WYfhlZWJhY`cf`ch\Yf`Zcfa 'cZUddfcdf]UhY`Yj]XYbWY"

5 7 ci fqY 5 i h\cf|lma UmYl W qY U qhi XYbh2fca WUqqYq cf UWlij |h|Yq Zcf i d hc cbY a cbh\" < ck Y j Yfz h\Ym a Um'Ugg][b'UXX]hcbU`UbX#cf'U`hYfbUh]j Y'hUg_g'hc'Ybgi fY'Wca d`]UbWY"'5'7 ci fgY'5i h\cf]miWcbg]XYf]b['h\Y [fubh]b[cZuvgYbWraighvYguh]gZjYX'u'gh XYbhk]```gh]```vY'uv`Y'hc'a YYhh\Y'WcifgY'g``Yufb]b[cihWcaYg UbX#cf'j c'i a Y'cZ'YUfb]b["'5 'gh XYbhgYY_]b['Uddfcj U'hc'VY'UVgYbhZcf'a cfY'h\Ub'cbY'a cbh\'a i qhUdd`m]b'k f]h]b['hc'h\Y'8YUb'UbX'dfcj]XY'U```cf][]bU``cf'Wfh]ZYX'gi ddcfh]b['XcW a YbhUh]cb"

: cf'a cfY']bZcfa Uhlcb'UVci hih\Y'UhhYbXUbWY'dfchcWc`q']b'h\Y': UW\`hmcZ5fhq'UbX'GcWjU` GWYbWrg. \httq.#k k k "Uffig"i bgk "YXi "Ui #W ffYbhgh XYbhg#UWJXYa]W]bZcfa Uhjcb#dfchcWc`g![i]XY`]bYg#

5 WUXYa]W = b Zcfa Uh cb ·

: cf`YggYbhJU``ghi XYbh`]bZcfa UhJcb`fY`UhJb[`hc.`fYei Yghg`Zcf`Yl hYbg]cb/fYj]Yk `cZa Uf_g/cWW dUhJcbU``\YU`h\UbX`gUZ/hm/Yl Ua]bUhJcb'dfcWXi fYg/gdYVJU``Wcbg]XYfUhJcb`]b`h\Y`Yj YbhcZ]``bYgg`cf`a]gUXj Ybhi fY/ghi XYbhYei]hmUbX`X]gUV]`]hm/UbX`ch\Yf`YggYbhJU``UWUXYa]W]bZcfa UhJcbž gYY`\hdg.#k k k "Ufhg"i bgk "YXi "Ui #W ffYbhghi XYbhg#JWUXYa]W]bZcfa UhJcb#dfchcWc`g![i]XY`]bYg#

7ci fgY 8YHJ] g

7 fYX]hDc]bhg *

Gi a a UfmcZh\Y 7ci fgY

Gi VYWh5fYU. A YX]U

\$\delta DfcXi Who Ghi X]c mci k \\ \delta k \\ \delta \delta \\ \delta \

5 hith Y WcbWi glcb cZth la Wci fgY th Y ghi XYbhik] "VY UV Y to

- % 8 Ya cbghfUhY 'g_]```]b 'dfc ZYgg]cbU``dfUWr]WY z'cf[Ub]gUh]cbz'h]a Y 'a UbU[Ya Ybhz'Wca a i b]WUh]cb 'UbX'U dYfgcbU``dfc Xi Wr]cb 'ghm`Y
- &" F YgdcbX'hc'Wf]hJWU``ZYYXVUW_']b'U'dfcZYgq]cbU``UbX'WfYUhJi Y'k Um'
- ' "8Ya cbghfuhY`Ub`i bXYfghUbX]b[`cZh\Y`fY`Uh]cbg\]d`cZZcfa žWcbhYbhUbX`Ui X]YbWY`]b`U`a YX]U dfcXi Whcb"
- ("5fh]W'`UhY`h\Y]f'd`UWY`]b'h\Y'k]XYf'AYX]U']bXi ghfm

HYUWX]b[GhfUhY[]Yg

DfcXi Wfjcb`Ghi X]c`]g`XYg][bYX`hc`fYUXmmci `Zcf`Z hi fY`Ya d`cma Ybhi]b`h\Y`a YX]U`dfcXi Wfjcb`]bXi ghfm''`5 dfcZygg]cbU``dfcXi Wfjcb`ghi X]c`Ybj]fcba Ybhik]``VY`WfYUhYX`k]h\]b`Wci fgY`fcca g"

Mci 'k]``VY'gi ddcfffYX'hc'k cf_'cb'U'gdYW]ZJWdfcZYgg]cbU`'dfc'YWfidfcj]XYX'Vm'U'W]Ybh''7`UggYg'k]``VY qffi Wfi fYX'hc'qi ddcffmci f'dfcXi Wficb'a Yf\cXg'UggcW]UfYX'k]h\mci f'gY`YWfX'W]Ybh'Vf]YZ'

Mci 'k]```\Uj Y'cddcfhi b]h]Yg'hc.
!a YYhk]h\ 'h\Y'W]Ybhg'UbX'X]gW gg'h\Y'Vf]YZ#g"
!Yb[U[Y']b'UWfj]h]Yg'hc'dfca chY'WfYUh]j Y'UbX'hYW\b]WU``g_]```XYj Y`cda Ybh'
!VYWca Y']a a YfgYX'`]b'dfUWfJWU``dfcXi Wf]cb'fYgYUfW\"
!k cf_'Wc``UVcfUh]j Y`mfcf']b'hYUa g'k \YfY'bYWfggUfmz"
!fYWY]j Y'Wf]h]WU``ZYYXVUW_'UbX'gi ddcfhZfca 'h\Y'`YWhi fYfz'dYYfg'UbX'h\Y'W]Ybh'
!d]hW\'Ub]XYU'UbX'dfYdUfY'U'dfcYWhdfcdcgU``]b'fYgdcbgY'hc'h\Y'7`]Ybh'Vf]YZ'

Mci 'k]```VY 'YbWci fU[YX 'hc 'hJ_Y 'fYgdcbg]V]`]mmZcf'mci f'dfcZYgg]cbU``dfUWf)W' Vm !dfYdUf]b['U'dfcZYgg]cbU``dfcdcgU``]bWi X]b['U'dfcXi Wf]cb 'gWXYXi 'Y'UbX'Vi X[Yh' !cf[Ub]g]b['a YYh]b[g'k]h\ 'mci f'W]Ybh' !Vcc_]b['dfcXi Wf]cb 'gdUWfg'UbX'Yei]da Ybh' !XYj Y`cd]b['UbX'[Uh\Yf]b['U``'h\Y'fYgci fWfg'mci 'fYei]fY 'hc '[Yh'h\Y'cV'XcbY" !dUfh]\M]dUh]b[']b 'fY[i `Uf`]bZcfa U``ZYYXVUW_gYgg]cb"

5ggYgga Ybh

 $\label{eq:hammer} H\Y`XYgWf]dh]cb`cZ`UggYgga~Ybh'hUg_g`UfY`bch'U`k~Umg`WcffYWh$

 $5\text{`k Umg'fYZYf'hc'h}\text{`Y'XYhU]'YX'Vf]YZ[]j\text{ Yb']}b\text{`WUgg'/'j}]\text{U'a ccX'Y'Zcf'U'``UggYgga Ybh'hUg_g}$

 $A\ cc\ X^*Y^*]b\ Zcfa\ Uh]cb^*Ub\ X^*]b^*WUgg^*]b\ Zcfa\ Uh]cb^*]g^*h\ Y^*WcffYWh^*]b\ Zcfa\ Uh]cb^*$

 $\label{thm:condition} $$HY']bZcfa$$ Uhjcb'cb'h]g'XcWaaYbh]g'[YbYfUhYX'Ui~hca~UhjWU``mUbX'WUb'``UW_XYhU]``UbX'UVWi~UfUWh''$$$

5ggYgga YbhHUg_g

5ggYgga Ybh'hJg_	K Y][\h	8i Y'8UHY	Gh XYbh@YUfb]b[Ci hWca Yg 5ggYggYX
A YX]U'DfcXi Whjcb'Dcfh7c`]c'	' \$1		

GhUfhXUhY. Bch5dd`]WUV`Y

 $@\textbf{Yb[h}. H\Y`XYgWf]dh]cb`cZ5ggYgga Ybh&`]g`]bWcffYWf'=hg\ci`X`fYUX``7`]YbhDfc^YWh!::]bU``8fUZhDfYgYbhUh]cb$

8YHJ]`g. '±xX]j]Xi U``dfc^YWf&\$!' \$`gYWcbXg`J]XYc"Gh XYbhg`fYWf]j Y`Zcfa Uh]j Y`j YfVU``ZYYXVUW_ž'k f]hh/b Wca a Ybhg`UbX`U`bi a Yf]WJ``[fUXY"

5XX]h]cbU`XYhU]`q.

H\YXYgWf]dh]cbcZUggYggaYbh&]g]bWcffYWf

±ig\ci`X'fYUX'

7`]YbhDfcYWh!:]bU`8fUZhDfYgYbHJh]cb

8 i Y']b'Ghi X]c'7 `Ugg'K YY_'- 'Hi YgXUm'% h\'GYdhYa VYf'cf'H\i fgXUm'&\$h\'GYdhYa VYfz'&\$%

5 k Umg fYZYf hc hk Y XYhU] YX Vf]YZ[]j Yb]b WUgg#] U a ccX Y Zcf mci f DYfgcbU DcfhZc]c / "G]nn Y" F YY DUW_U[Yž]bWi X]b[]bZcfa Uh]cb UVci hhk Y : fYY UbW A Uf_Yh8 Um'

A ccX`Y`]bZcfa Uhjcb`UbX`]b`WUgg`]bZcfa Uhjcb`]g`h\Y`WcffYWh]bZcfa Uhjcb"

H\Y`]bZcfa Uhlcb`cb`h\]g'XcWa Ybh]g'[YbYfUhYX'Ui hca UhlWU``m'UbX'WUb``UW_XYhU]`'UbX'UVWV UfUWh'

Gi Va]gg]cb'bchYg.8i Y']b'Gh X]c'7`Ugg'K YY_'-'Hi YgXUm'% h\'GYdhYa VYf'cf'H\i fgXUm'&\$h\'GYdhYa VYfž &\$%

5ggYgga Ybh' . 7`]YbhDfc YWh&

GhUfhXUhY. Bch5dd`]WUV`Y

8YHJ]`g. →XJj]Xi U``cf`Ga U``; fci d`fi d`hc'' Ł: cfa Uh/ Xi fUh]cb gdYWJZ]Whc'h\Y''W]Ybh'Vf]YZ'`fJ]XYcž 5b]a Uh]cb cf`Gci bXŁ"H\]g`]g`h\Y`Z]bU``UggYgga Ybh'HJg_`Zcf`UhhYbXUbWY'di fdcgYg"Ghi XYbhg`fYWY]j Y`j YfVU` ZYXVUW_`Zfca '@YWhi fYf/ '7`]Ybh'UbX'U'bi a Yf]WU``[fUXY"

5XX]h]cbU`XYHJ]`q.

5 k Umg fYZYf hc h\Y XYhU] YX Vf]YZ[]j Yb]b WUgg#]U a ccX`Y"

A ccX'Y]bZcfa Utjcb UbX]b WUgg]bZcfa Utjcb]g th Y WcffY WtjbZcfa Utjcb"

H\Y`]bZcfa Uhlcb'cb'h\]g'XcW a Ybh]g'[YbYfUhYX'Ui hca UhlWU``mUbX'WUb'`UW_XYhU]`'UbX'UVWV UfUWh'

Gi Va]gg]cb bch/g.8i Y]b Gh X]c 7 Ugg K YY_ % fHi YgXUmcf H\i fgXUmL

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

 $Gh\ XYbhg\ 'UfY\ 'YI\ dYWhYX\ 'hc\ 'di\ hh\ Y]f\ 'bUa\ Yg\ 'UbX\ 'gh\ XYbhbi\ a\ VYfg\ 'cb\ 'Yj\ YfmdU[\ Y\ 'cZh\ Y]f\ 'Ugg][\ ba\ Ybhg\ ''$

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

- K cf_'gi Va]hhyx'%5'hc'% 'XUmg'UZhYf'h\Y'gh]di `Uhyx'XYUX`]bY'k]``'VY'UggYggYX'UbX'ZYYXVUW_dfcj]XYX'Vi h'U'a Uf_'cZnYfc'k]``'VY'fYWcfXYX'''=Zh\Y'k cf_'k ci `X'\Uj Y'fYWf]j YX'U'dUgg'a Uf_'Vi h'Zcf h\Y'`'UhYbYgg'UbX'h\Y'k cf_']g'U'Wca di `gcfm'Wci fgY'Wca dcbYbh'f\i fX`Y'fYei]fYa Ybhz'U'gh XYbh'k]`` VY'XYYA YX'hc'\Uj Y'a Yhh\Uh'fYei]fYa Ybh/
- K cf_'gi Va]hhYX`&\$`cf`a cfY`XUmg`UZhYf`h\Y`gh]di `UhYX`XYUX`]bY`k]```bchVY`UWWdhYX`Zcf UggYgga YbhUbX`k]```fYWY]j Y`bc`ZYYXVUW_ža Uf_'cf`[fUXY"'=Zh\Y`UggYgga YbhHUg_']g`U`Wca di `gcfm Wca dcbYbhcZh\Y`Wci fgY`U`gh XYbhk]```fYWY]j Y`Ub`l bgUh]gZJWcfm: U]``fl : Ł'[fUXY`Ug`U`fYgi `hcZ i bgUh]gZJWcfmdYfZcfa UbWY`]b`Ub`YggYbh]U``Wca dcbYbhcZh\Y`Wci fgY"

H\]g']bZcfa Uh]cb']g'U`gc'Uj U]`UV`Y'Uh

\hdg.#k k k "Uffg"i bgk "YXi "Ui #W ffYbhgh XYbhg#UWJXYa]W]bZcfa Uhcb#dfchcWc`g![i]XY`]bYg#

GdYWJU`7cbg]XYfUhJcb5dd`JWUhJcbg

 $\label{thm:condition} $$Mci `WUb`Udd`m'Zcf'gdYW]U``Wcbg]XYfUh]cb`k \Yb`]``bYgg`cf`ch\Yf'W]fW a ghUbWfg`]bhYfZYfY`k]h\`mci f UggYgga Ybh'dYfZcfa UbWf''$

G]W_bYggža]gUXj Ybhi fY'cf'ch\Yf'W]fW a ghUbWrg'VYmcbX'mci f'Wcbhfc``a Um

ł DfYj Ybhmci Zfca Wca d`Yhjb['U'Wci fgY'fYei]fYa Ybhž

ł? YYd mci Zfca 'UttYbX]b['Ub'UggYggUV'Y'UWt]]tmž

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

ł G][b]Z]WUbhmUZZYWimci fidYfZcfa UbWijbiUggYggUV`Yik cf_žVYi]hUiZcfa U``YbX!cZlgYa YghYfiYl Ua]bUh]cbž'U WUqqihYqhž'Ui`UVcfUhcfmhYqhž'UiqYa]bUfidfYqYbhUh]cbicfiUbmch\YfiZcfa icZiUqqYqga Ybh'

cfilia fth Yfixyfuljgi]bify`uhjcbihciGdYWju`i7 cbg]XYfuhjcbi]bWi X]b[iiK \Ybihci5dd`mižii<ckihci5dd`mi`ubXiiGiddcfhjb[i8cWia Ybhuhjcbiid`YugYifyZyfihcih\YiGdYWju`i7 cbg]XYfuhjcbik YVghjY.ii\hdg.#ghiXYbhibgk "YXii"ui #gdYWju`iWcbg]XYfuhjcb

5 WUXYa]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"'\lefi\Wb'hU_Y`a Ubm Zcfa gžZfca `XY`]VYfUhY`W\YUh]b['hc`UVW]XYbhU`mWcdm]b['Zfca `U`gci f\W' k]h\ci hUW_bck `YX[Ya Ybh'

IBGK [fcidgdu[]Uf]ga]bhch\YZc``ck]b[WUhY[cf]Yg.

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

⇒ Uddfcdf]UhY 'dUfUd\fUg]b[...7\Ub[]b['U'ZYk 'k cfXg'UbX'd\fUgYg'k \]'Y 'a cghmfYhJ]b]b['h\Y'cf][]bU` ghfi Wh fY 'UbX#cf'dfc[fYgg]cb'cZ]XYUg'cZh\Y'cf][]bU'žUbX']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]hUbX'hc d]YW]b['hc[Yh\Yf'ei chYg'UbX'dUfUd\fUgYg']bhc'U'bYk 'k \c`Yžk]h\ci hUddfcdf]UhY'fYZYfYbW]b["

 $7c^{i}$ g]cb. 'k cf_]b['k]th. 'cth. Yfg'Vi h'dUgg]b['c\Zth. Y'k cf_'Ug'U'dYfgcb'g']bX]j]Xi U''k cf_"'7c''i g]cb'U'gc

7ci fgY GWXYXi `Y

J]Yk 'WUgg'ha YHUV'Y

H]a YtUV`Y

8UHY	Hmd Y	7 cbh/bh
K YY_'%'&' '>i `m'!'&- '>i `m	Gh X]c	5b°CjYfj]Yk°?V[S%""(BdaVgUf[a`EfgV[a
K YY_'&.'' \$'>i`m!') 5i[igh	Gh X]c	A 7 =7 ; i YghGdYU_Yf
K YY_'' . '* '5i [i gh! '‰ 5i [i gh	Gh X]c	5 (W f B da WUf B dWb da V g Uf[a`
K YY_'(.'%'5i[igh!'% 5i[igh	Gh X]c	EbWU[S^9gWefEbWS]WdF45
K YY_`).`&\$`5i[igh!`&* 5i[igh	Gh X]c	5 (W f B da WUf B da V g Uf[a`
K YY*.^&+^5i[igh!^& GYdhYa VYf	Gh X]c	8dWWS`UWdEWfŽgb ~ ? SdJWf
K YY_'+.'' 'GYdhYa VYf'!'- GYdhYa VYf	Gh X]c	5 (W f B da WUf B da V g U f [a`
K YY_', .'%\$'GYdhYa VYf'! %*'GYdhYa VYf	Gh X]c	5 (W f B da WUf B da V g U f [a`
K YY_''%+'GYdhYa VYf'! &' 'GYdhYa VYf	Gh X]c	DfYgYbhJhjcb~cZ7~]Ybhdfc~YWh#YYXVUW_`gYgg]cb
6fYU'&('GYdhYa VYf'! ' \$'GYdhYa VYf		
K YY_'%\$, '%'C WcVYf'! '+ C WcVYf	Gh X]c	7`]YbhDfcYWhDfcXiWh]cb/ 7cbgi`HUh]cb
K YY_'‱', 'C WcVYf'!'%(C WcVYf	Gh X]c	7`]YbhDfcYWhDfcXiWhJcb/'7cbgi`HUhJcb
K YY_'%&.'%) 'C WcVYf'! &%'C WcVYf	Gh X]c	GWYYb]b[/ '8Y`]j YfmicZ:]bU`DfcYWh

F Ygci fWYg

DfYgWf]VYX F Ygci fWYg