

GSOE9712

9b[]bYYf]b['GHJh]gh]Wg'UbX'9IdYf]a Ybh8Yg][b

HYfa 'C bY''##'&\$&%

5ggYgga Ybh

5ggYgga Ybh'HUg_g

5ggYgga Ybh'tUg_	K Y][\h	8iY'8UHY	Gh XYbh@YUfb]b[Ci hWca Ygʻ5ggYggYX
5gg][ba Ybh) \$1	K YY_'+'UbX'%\$	%ž'&ž'' ž'(
C b`]bY'E i]n'I''	%) ।	K YY_'' ž'+'UbX'-	%ž`&ž`'
:]bU``91 Ua `	')	:]bU``YI Ua `dYf]cX	%ž'&ž''

5ggYgga Ybh'8YhJ]`g

5ggYgga Ybh'% 5gg][ba Ybh

8 YHJ]`g.

Ghi XYbhgʻk]``k cf_`]bʻUʻhYUaʻfa]b"ʻ&ža UI "''ʻa Ya VYfgʻdYfʻhYUa ŁhcʻUbUʻmgYʻUbʻ]bXi ghfm!VUgYXʻWUgY ghi XmʻrGhi XYbhgʻ\Uj Yʻhcʻ]XYbhJmjggi YgždʻUbʻYI dYf]a YbhgʻhcʻWcʻ`YWhXUHUžʻUbUʻmgYʻg]a i `UhYXʻXUHUž i bWtj YfʻhfYbXgʻUbXʻXYf]j Yʻ]a dfcj Ya YbhighfUhY[]YgʻZcfʻa UbU[Ya YbhicZh\YʻVi g]bYgg"ʻGhi XYbhihYUaʻk]`fYWY]j YʻZYYXVUW_j jUʻUʻa Uf_]b[ʻfi Vf]WgʻUbXʻdYfgcbUʻ]gYXʻZYYXVUW_"

5ggYgga Ybh'& 'Cb`]bY'Ei]n'I'

8YHJ]`g.

-		
	T	

			, h\ YXž7\UdhYf`%\$
K YY_'%\$.'%- 5df]`	.24 []	@YWnifY	FYgdcbgY'GifZUWY'AYh\cXg'UbX'8Yg][b
Surj			A cbh[ca Yfmž8Yg][b`UbX`UbU`mg]g`cZYI dYf]a Ybhgž , h\`YXž7\UdhYf`%%

Gi Va]gg]cb cZ5ggYgga YbhHUg_g

5ggYgga Ybhgi Va]gg]cb UbX a Uf_]b[Wf]hYf]U

G\ci`X'h\Y'WcifgY'\UjY'Ubmbcb!Y`YWfcb]WUggYgga Ybh'gi Va]gg]cbž'h\YgY'g\ci`X'\UjY'U'ghUbXUfX GW\cc`'WcjYf'g\YYh'

5```gi Va]gg]cbg`UfY`YI dYWYX`lc`VY`bYUh`UbX`WYUf`mgYhci h'`Mci f`fYgi `hg`UfY`h\Y`d]bbUWY`cZU```mci f`\UfX k cf_'UbX`g\ci `X`VY`lfYUh'X`k]h\`Xi Y`fYgdYWf'`DfYgYbh]b[`fYgi `hg`WYUf`m[]j Yg`h\Y`a Uf_Yf`h\Y`VYghW\UbW' cZi bXYfgHUbX]b[`mci f`a Yh\cX/Yj Yb`]Zh\Y`bi a Yf]WU``fYgi `hg`UfY`]bWcffYWf

A Uf_]b['[i]XY`]bYg`Zcf`Ugg][ba Ybhgi Va]gg]cbg`k]```VY`dfcj]XYX`Uhh\Y`gUa Y`h]a Y`Ug`Ugg][ba YbhXYhU]`g hc`Ugg]ghk]h\`a YYh]b['UggYggUV`Y`fYei]fYa Ybhg"`Gi Va]gg]cbg`k]```VY`a Uf_YX`UVWcfX]b['hc`h\Y`a Uf_]b[[i]XY`]bYg`dfcj]XYX"

@UhY 'dc`]Wh

 $\label{thm:condition} $$HY^UHY'dYbU'mm]g'Udd']YX'dYf'WUYbXUf'XUmf]bWi X]b['k YY_YbXg'UbX'di V']W\c`]XUmgŁ'h\Uh'h\Y UggYgga Ybh']g'cj YfXi Y'''H\YfY']g'bc'dfc!fUhU'cZh\Y''UhY'dYbU'mmZcf'gi Va]gg]cbg'a UXY'dUfhk Umh\fci [\'UXUm'$

 $\label{eq:conversion} \text{K cf_'gi Va]} \text{httx:'UZhtf:h.Y:'XYUX`]bY:'Zcf:'UVgc`i htt:'ZU]'':]g'bchUWWtdhtx:'UbX:'U'a Uf_'cZ'nYfc'k]```VY'Uk UfXYX Zcf:h.Uh:'UgqYgga Ybh']hta " } \\$

: cf`gca Y`UggYgga Ybh`]hYa gž`U``UhY`dYbU`hma Umbch`VY`Uddfcdf]UhY"`H\YgY`UfY`WYUf`m`]bX]\WUhYX`]b`h\Y Wci fgY`ci h`]bYž`UbX`gi W\`UggYgga Ybhg`fYWY]j Y`U`a Uf_`cZnYfc`]Zbch`Wca d`YhYX`Vmh\Y`gdYWJZJYX`XUhY" 9I Ua d`Yq`]bWi XY.

%" K YY_`mcb`]bY`hYghg`cf``UVcfUhcfmk cf_`k cfh\`U`ga U```dfcdcfh]cb`cZh\Y`gi VYWha Uf_žcf &" C b`]bY`ei]nnYg`k \YfY`Ubgk Yfg`UfY`fY`YUgYX`hc`gh XYbhg`cb`Wca d`Yh]cbžcf

- ' "DfcZYgg]cbU``UggYgga Ybh'hUg_gž'k\YfY`h\Y`]bhYbh]cb`]g`hc`WfYUhY`Ub`Ui h\Ybh]WUggYgga Ybh'h\Uh\Ug`Ub`UVgc`i hY`gi Va]gg]cb`XUhYžcf
- ("DUgg# U] UggYgga YbhHJg_g"

91 Ua]bUh]cbg

Mci 'a i gh'VY'Uj U]`UV`Y'Zcf'U```ei]nnYgž'hYghg'UbX`YI Ua]bUh]cbg": cf'Wci fgYg'h\Uh\Uj Y'Z]bU``YI Ua]bUh]cbgž h\YgY'UfY'\Y`X'Xi f]b['h\Y'I b]j Yfg]hmYI Ua]bUh]cb'dYf]cXg.': YVfi Ufm'Zcf'Gi a a Yf'HYfa ž'A Um'Zcf'H\ž 5i [i gh'Zcf'H\&ž'UbX`Bcj Ya VYf#8 YWYa VYf'Zcf'H' "

D`YUgY'j]g]ha m BGK 'Zcf'Dfcj]g]cbU``91 Ua]bUh]cb'h]a YhUV`Y'di V`]g\'XUhYg": cf'Z fh\Yf']bZcfa Uh]cb'cb Yl Ua gž'd`YUgY'gYY'h\Y'<u>91 Ua g</u>'k YVdU[Y"

GdYWJU 7cbg]XYfUh]cb

⊋mci `\Uj Y`YI dYf]YbW/X`Ub`]``bYgg`cf`a]gUXj Ybh fY`VYmcbX`mci f`Wcblfc``h\Uhk]```]bhYfZYfY`k]h\`mci f

UggYgga YbhdYfZcfa UbWYžmci 'UfY'Y`][]V`Y`hc'Udd`m'Zcf'GdYWJU``7cbg]XYfUhJcb'df]cf'hc'gi Va]hhJb['UbUggYgga Ybhcf'g]hhJb['Ub'Yl Ua"

I BGK 'bck '\Ug'U': <u>]hhc'G]h#Gi Va]hffi 'Y</u>ž'k \]W\ 'a YUbg'h\Uh]Zmci 'UhhYa dh'Ub'YI Ua 'cf'gi Va]h'U'd]YW''cZ UggYgga Ybhž'mci 'UfY'XYWUf]b['mci fgY`ZZ]hYbci [\'hc'Xc'gc'UbX'WJbbch`UhYf'Udd`m'Zcf'GdYW]U` 7 cbg]XYfUh]cb"

: cf`XYhJ]`g`cZUdd`m]b['Zcf`GdYV]U``7 cbg]XYfUh]cb`UbX`WcbX]h]cbg`Zcf`h\Y`Uk UfX`cZgi dd`Ya YbhUfm UggYgga Ybhžd`YUgY`gYY`h\Y`]bZcfa Uh]cb`cb`l BGK 'g`<u>GdYV]U``7 cbg]XYfUh]cb`dU[Y</u>"

D`YUgY'lbochtY

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

 $\label{thm:continuous} IBGK ``Ug`Ub`cb[c]b[`Wcaa]haYbhhc`ZcghYf]b[``U`W``hifY`cZ`YUfb]b[`]bZcfaYX`VmUWUXYa]W]bHY[f]hm'`5``IBGK `ghiXYbhg`UjY`U`fYgdcbg]V]`]hmhc`UX\YfY`hc`h\]g`df]bW]d`Y`cZUWUXYa]W]bHY[f]hm'D`U[]Uf]gaibXYfa]bYg`UWUXYa]W]bHY[f]hmUbX`]g`bchhc`YfUhYX`UhIBGK "`B'SY[Sde_SfG@EI[eVW{`WSege[YfZW_aXSekagdai`ž$

Mci 'UfY'U'gc'fYa]bXYX'h\UhWUfYZ ``h]a Y'a UbU[Ya Ybh]g'Ub']a dcfhUbhdUfhcZgh XmUbX'cbY'cZh\Y]XYbh]Z]YX'WUi gYg'cZd`U[]Uf]ga ']g'dccf'h]a Y'a UbU[Ya Ybh'Gh XYbhg'g\ci `X'U``ck 'gi Z]W]Ybh'h]a Y'Zcf fYgYUfW\žXfUZ\]b['UbX'h\Y'dfcdYf'fYZYfYbW]b['cZgci fW/g']b'dfYdUf]b['U```UggYgga Ybh'hUg_g''

₹d`U[]Uf]ga i]gʻZci bXi]bimci fik cf_ik \Ybimci i'UfYi]b iZ[fghmYUfžimci fiYVWi fYfik]``cZYfimci i'Ugg]gHUbWYihc
]a dfcj Yimci fiUWUXYa]Wg_]``g'''H\Yma UmUg_imci ihci`cc_'Uhigca Yicb`]bYifYgci fWygžiUhhYbXih\Yi@YUfb]b[
7 YbhfYžicfigca Yh]a YgifYgi Va]himci fik cf_ik]h\h\YidfcV`Ya iZ[IYX'''< ck Yj Yfia cfYigYf]ci gi]bghUbWygi]biZ[fgh
mYUfžigi W\ugighYU`]b[iUbch\Yfighi XYbhgik cf_icfidUm]b[igca YcbYihciXcimci fik cf_žia UmVYi]bj Ygh][UhYX
i bXYfih\YiGhi XYbhA]gWcbXi WhDfcWYXi fYg''

FYdYUHYX'd`U[]Uf]ga 'fYj Yb']b'Z|fghmYUfłź'd`U[]Uf]ga 'UZHYf'Z|fghmYUfźcf'gYf]ci g']bghUbWYgža Um'U`gc'VY]bj Ygh][UhYX'i bXYf'h\Y'Gh XYbhA]gWcbXi WhDfcWYXi fYg"'H\Y'dYbU'h]Yg'i bXYf'h\Y'dfcWYXi fYg'WUb']bWi XY U'fYXi Whcb']b'a Uf_gž'ZU]`]b['U'Wci fgY'cf'Zcf'h\Y'a cghgYf]ci g'a UhHYfg'fi]_Y'd`U[]Uf]ga ']b'Ub'\cbci fg h\Yg]gŁYj Yb'gi gdYbg]cb'Zfca 'h\Y'i b]j Yfg]mm''H\Y'Gh XYbhA]gWcbXi WhDfcWYXi fYg'UfY'Uj U]`UV'Y'\YfY.

kkk"[g"i bgk"YXi"Ui #dc]Wn#XcWa Ybhg#ghi XYbha]gWcbXi WhdfcWYXi fYg"dXZ

5 WUXYa]W = b Zcfa Uh cb

7 fYX]hdc]bhg

7 ci fgY`WfYX]h`]g`WU`W`UhYX`]b`I b]hg!C Zi 7 fYX]hfl C 7 \!"H\Y'bcfa U``k cf_`cUX`YI dYWfUh]cb`Zcf`cbY`I C 7]g`UddfcI]a UhY`m'&) `\ci fg`dYf`hYfa "'H\]g`]bWi XYg`WUgg`WcbhUWh`\ci fgz`df]j UhY`ghi Xmz`ch\Yf``YUfb]b[UWfj]]h]Ygz`dfYdUfUh]cb`UbX`h]a Y`gdYbh'cb`U```UggYggUV`Y`k cf_"

A cgh'Wci fgYk cf_'Wci fgYg'Uhl BGK 'UfY'*'I C7'UbX']bj c'j Y'Ub'YghJa UhYX'%) \$`\ci fg'hc'Wca d'YhYž'Zcf'Vch\fY[i`Uf'UbX']bhYbg]j Y'hYfa g"'9UW\ 'Wci fgY']bWi XYg'U'dfYgWf]VYX'bi a VYf'cZ\ci fg'dYf'k YY_'fh\#k\2cZ gW\YXi `YX'ZJ\WY!hc!ZJ\WY'UbX\#cf'cb`]bY'WcbhU\Wf'5bmUXXJhJcbU`hJa Y'VYmcbX'h\Y'dfYg\Wf]VYX'WcbhU\Wf\ci fg g\ci `X'VY'gdYbh]b'a U_]b['gi fY'h\Uhmci 'i bXYfghUbX'h\Y'`Y\Wi fY'a UhYf]U'ž\Wca d`YhJb['h\Y'gYh Ugg][ba Ybhgž'Z ff\Yf'fYUX]b['z'UbX'fYj]g]b['k\YY_]g] UXXY\WJ'\decb'Ubg \\%

a dcfhUbh'@]b_g

<u>i</u>