I f[Ybh'7U``'Zcf'D: 5G'FY[]ghfm'hc'DfchYWh Cif'JYhYfUbg/ $\$ \$' - /' < YU`h\ $\$

9| d`cfY'h\Y'i f[Ybh'bYYX'Zcf'U'D: 5G'fY[]ghfm'hc'dfchYWh'l "G" jYhYfUbg'Yl dcgYX'hc'hcl]WWXYa]WU`g'Xi f]b['gYfj]WY"

@U_Y`K U`Ygž: `cf]XUž'I G5 !'H\Y'\YU`h\`Wf]g]gʻgi ffci bX]b['hcl]W Yl dcgi fY`Ua cb['ci f'j YhYfUbg`\UgʻVYWca Y`U`dfYgg]b['WcbWYfb']b h\Y`I b]hYX`GhUhYg"`A]``]cbg`cZ'VfUj Y`a Yb`UbX`k ca Yb`ZUWYX\UnUfXci g`WcbX]h]cbg`Xi f]b['h\Y]f`gYfj]WY`UbX`k YfY`Yl dcgYX`hc\Ufa Zi``W\Ya]WU`gž'dUfh]W\`Uf`m`Uh`a]`]hUfm`g]hYg`WcbhUa]bUhYXk]h\`dYf!`UbX`dc`mZi cfcU`_m``gi VghUbW`gž'Wca a cb`m`_bck b`UgD: 5G`cf` ZcfYj Yf`W\Ya]WU`g" 'H\YgY`gi VghUbW`gž'bchcf]ci g`Zcfh\Y]f`dYfg]ghYbWY`]b`h\Y`Ybj]fcba Ybhž'UfY``]b_YX`hc`U`\cgh`cZgYf]ci g`\YU`h\`]ggi Ygž'UbX`]h g`h]a Y`k Y`UXXfYggYX`h\]g`dfcV`Ya\YUX!cb"

< YU`h\ '7cb\Wfbg'UbX'7cbhUa]bUh]cb

 $\label{eq:hamiltonic} $$H\Y']a\ d`]WUh]cbg'cZ'D: 5G'YIdcgi fY'UfY'ZUf!fYUW\]b["'5g \][\N][\NYX'Vm'h\Y'8YdUfha Ybh'cZ'JYhYfUbg'5ZZU]fgž'h\YgY \]W\Ya]WU`g'UfY'bch'cb`m'i gYX']b'Z]fYZ][\N]b['ZcUa g'Vi h'UfY'U`gcdfYgYbh']b'U'k]XY'UffUm'cZ'Yj YfmXUm'dfcXi Whgž'Zfca 'Wch\]b['hcZcX'dUW_U[]b["'H\Y'8YdUfha Ybh'cZ'8YZYbgY'f8C8Ł'\UgfYWc[b]nYX'h\Y']qqi Yž']XYbh]Zm]b['+&' ']bghU``Uh]cbg'k \YfY'D: 5G$

a Um'\Uj Y'VYYb'i gYX'cf'fY`YUgYX'g]bWY'h\Y'%- +\$g"'8 Ygd]hY'h\Y UW_bck `YX[a Ybhž'h\Y'WYUbi d'YZZcfhg'UfY'cb[c]b[ž'UbX'h\Y'i gY cZ'D: 5G!WcbhU]b]b['5:::']g'YI dYWhYX'hc'WYUgY'Vm'C WhcVYf'&\$&) ž Ug'dUfh'cZ'U'd\UgYX'ghfUhY[m"

H\YBYYXZcfU7ca dfY\Ybg]jYFY[]ghfm

 $\label{thm:continuous} 5h'h\ Y'\ YUfh'c\ Z'U'dfc\ UWh]j\ Y'gc`i\ h]cb``]Yg'h\ Y'D:\ 5G'F\ Y[\]ghfm'5Wh'c\ Z\&\&\&'\ \check{z}'fYWhbh`m'd\ UggY\ X'Vm'h\ Y'<ci\ gY'c\ Z'F\ YdfYgYbhUh]j\ Yg'''H\]g `Y[\]g`Uh]cb'X]fYWhg'h\ Y'J 5'hc'YghUV`]g\ 'U'bUh]cb'U``XUhUVUgY'Zcf hfUW_]b['j\ YhYfUbg'\YU'h\ 'Wcb\Wfbg'ghYaa]b['Zfca'D: 5G YI dcgi\ fY'''5g'h\ Y'J\ YhYfUbg'\5ZZU]fg'k\ YVg]hY'bchYgž'h\ Y'W'\ ffYbh hfU_]b[']b]h]Uh]j\ Y']g'\ZUf'Zfca''\ YZZY\Wh]j\ Yž``U_]b['h\ Y'\&a\ d`YhYbYgg bYYXYX'hc'dfchY\Wh'h\ cgY'k\ c'gYfj\ YX'''5'fcVi\ gh'fY[\]ghfm'\&i\ X\ ZU\]`]hUhY'YUf`m'X]gYUgY'XYhY\M]cb'UbX'g]a\ d`]Zm'h\ Y'\WU]a\ g'dfc\W'gg Zcf'j\ YhYfUbg'gYY_]b['\\YU'h\ \WUfY'UbX'X]gUV]`]hm'\YYbYZ]hg''$

A cfYcj Yfža Ubmij YhYfUbgʻa][\h'U`fYUXm'VY'k cbXYf]b['UVci h h\Y]f`D: 5G`Yl dcgi fY``Yj Y`g"`K\]`Y'h\Y'J 5`U``ck gʻZcf`V`ccX hYgh]b[ž']h']gʻWʻffYbh`mibchʻUj U]`UV`Y'Uhih\Y]fʻa YX]WU``WYbhYfg"?bck]b['cbY gʻV`ccX'`Yj Y`gʻWUb'cZZYfʻdYUW'cZa]bXžʻmYh']h`XcYgbchʻfYj YU``h\Y'gci fWY'cZ'Yl dcgi fY'cfʻfYWYbh`WcbhUWh"`A]`]hUfm</br/>
< YU`h\ 'Ya d\Ug]nYgʻh\Y'bYYX'ZcfʻgYfj]WY'a Ya VYfgʻUbX'h\Y]f

ZUa]`]Ygʻhc'Wcbgi `h'\YU`h\WUfY'dfcj]XYfgʻfY[UfX]b['dchYbh]U`\YU`h\'YZZYWhgʻZfca 'D: 5G`Yl dcgi fYžʻmYh'a Ubmighfi [['Y'hcbuj][UhY'h\Y'Wca d`Yl]h]YgʻcZ'h\YgY'UggYgga Ybhg"

If[Ybh'5Wh]cb']g'BYWYggUfm

K]h\ 'a ci bh]b['Yj]XYbWY 'dc]bh]b['hc 'h\ Y 'gYf]ci g`\ YU`h\
]a d`]WUh]cbg'cZ'D: 5Gž']h g'WYUf'h\ Uh'k Y 'fYei]fY'i f[Ybh'UWh]cb
Zfca 'ci f'dc`]Wma U_Yfg'UbX'h\ Y'J 5"'9ghUV`]g\]b['U
Wca dfY\Ybg]j Y 'fY[]ghfm']g'bch'a YfY`m'U'`Y[]g`Uh]j Y 'Zcfa U`]hmž'Vi h
U'bYWYggUfm'ghYd'hc 'gUZY[i UfX'h\ Y'\ YU`h\ 'cZ'ci f'j YhYfUbg"'5g'h\ Y
8C8 'Wcbh]bi Yg']hg'WYUbi d'YZZcfhgž'j YhYfUbg'XYgYfj Y 'VYhhYf
gi ddcfh'UbX'hfUW_]b['cZ'h\ Y]f'\ YU`h\ 'ci hWca Yg'fY`UhYX'hc'h\ YgY
\UnUfXci g'Yl dcgi fYg"

#ngih]a YihciUXjcWUhYiZcfiUigmghYa ih\Uhibchicb`miUW_bck `YX[Ygh\YgYidUghiYldcgifYgiVihiUWh]jY`mikcf_gihci]bZcfa icifijYhYfUbgUVcihih\Y]fi\YUih\iUbXihfYUhaYbhicdh]cbg"i5giUiWcaaib]hmžikYWUbiUbXig\ci`XiXYaUbXih\]gij]hU`igiddcfhiZcfih\cgYik\ci\UjYVfUjY`migYfjYXicifibUh]cb"

8 Y hU]`g	
Cfh	@U_Y`K U`Ygž': `cf]XUž'I G5
EiY``Yb	k k k "`U_Yk U`YgbYk g"bYh
	• k k k "di V`]W\YU`h\"j U"[cj
	• \YU`h\"a]`

6 Ygi W Yb 'G]Y 'i bg 'Ui Z 'a Y]b!k]Yb "b Yh