

ENGG9743

: i Y``7 mWYžK UghY`UbX`@]ZY`7 mWY`A UbU[Ya Ybh

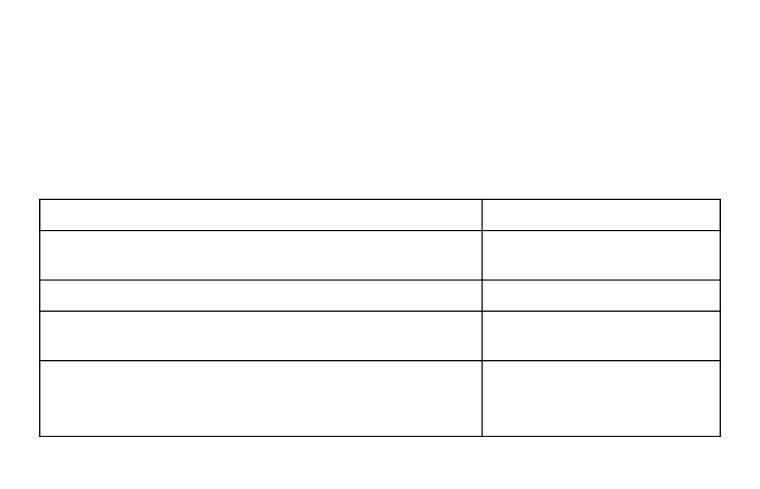
HYfa 'C bY''##'&\$&%

 $\label{thm:condition} $$H^*D^*UgY^*bch'Y^*h.Uhh.Y^*GW.cc^*CZZWY^k \]^*^bch_bck^k.Yb\#Zmcif^WcifgY^*WcbjYbcf^*]g^*cb^*WJadig^*cfUjU]^*UV^*Y$$$

9a U]`

<u>9b[]bYYf]b['Ghi XYbh'Gi ddcfh'GYfj]W</u> g'- 'W ffYbh'ghi XYbh'Ybei]f]Yg

• Y"[""Ybfc`a Ybhž'dfc[fYgg]cbž'WUg\"fYei Yghgž'Wci fgY']ggi Yg'cf'dfc[fUa!fY`UhYX'ei Yf]Yg



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		I

hc[Yh\Yf'k]h\gca Y'fYUX]b[a UhYf]U""5 ghi XYbhfbf'[fci d'cZghi XYbhgb'k]" VY'bca]bUhYX'Ug'h\Y'hcd]W a cXYfUhcffgb"H\Ymk]""dfcj]XY'Ub']b]hJU"gi a a UfmcZh\Y'hcd]WbX'UbX'Ug_'dfcj cWUhj Y'ei Ygh]cbg"'H\Y'YbhfY WUgg'k]""dUfhJW]dUhY'k]h\h\Y]f'Wa a Ybhg'UbX'cd]b]cbgža U]bhJ]b]b['U'Wc"Y[]U"UbX'YbWti fU[]b['Zcfa 'Zcf XYVUhY"'H\Y'ghi XYbhg'UfY'YI dYWhYX'hc'dfcj]XY'U'a]b]a i a 'cZhk c']bhYfUWn]cbg'UbX'&\$\$'k cfXg'dYf'hcd]W H\Y'hcd]Wa cXYfUhcf'k]""U'gc'VY'UggYggYX'cb'h\Y]f'UV]"]hmhc'a U]bhU]b'U'j]VfUbhUbX'fYgdYWn] "XYVUhY Ybj]fcba Ybh'

5```a Uf_g'UfY'dUgg#ZU]``UbX']bX]j]Xi U`"

A Uf_g'k]``VY'fYh fbYX'UhfY`YUgY'cZZbU``fYgi `hg"

8YUX`]bY ZcfUVgc`i hY ZU]`. B#5

5ggYgga Ybh' . ei]nnYg

GhUfhXUhY. Bch5dd`]WUV`Y

8YHJ]`g. kk c 'cb`]bY 'ei]nnYg

5XX]h]cbU`'XYhU]`g.

H\Y'ei]nnYg'HYghg'UbU`mh]\WD`'UbX`\Wf]h]\WD`'h\]b_]b['UbX`[YbYfU`'i bXYfgh'UbX]b['cZh\Y'\\circ ifgY'a UhYf]U`']b'U \\chibhfc``YX`ZUg\]cb"'EiYgh]cbg'a UmVY`XfUk b'Zfca 'UbmUgdY\WicZh\Y'\\chibh fgY'\\chij YfYX'i bhj`'h\Y'k YY_ \\dfY\W'X]b['h\Y'hYghz'i b`Ygg'gdY\\JZ\\WD``m]\bX]\\WD\YX'ch\Yfk]gY'\mh\Y'`Y\\mi fYf"'A Uf_g'k]```\Y'\Ugg][bYX \\U\\chi\Y'\chi\Y'\\chi\Y'\\chi\Y'\chi\Y\chi\Y'\chi\Y'\chi\Y'\chi\Y\chi\Y\chi\Y'\chi\Y'\chi\Y'\chi\Y'\chi\Y'\chi\Y'\chi\Y'\chi\Y\chi\Y'\chi\Y\\chi\Y\chi\Y\chi\Y\chi\Y\chi\Y\chi\Y\chi\Y\chi\Y\\chi\Y\\chi\Y\\chi\Y\\chi\Y\chi\Y\chi\Y\chi\Y\chi\Y\chi\Y\chi\Y\chi\Y\\chi\Y\\chi\Y\\chi\Y\\chi\Y\\chi\Y\\chi\Y\\chi\Y\\chi\Y\\chi\Y\\chi\

H\YgY'UfY']bX]j]Xi U`'hYghg

A Uf_g`k]```VY`fYh fbYX`k]h\]b`cbY`kYY_`cZYUV\`ei]n`Wca d`Yh]cb"

8 Y U X`]b Y 'Zcf' U V gc`i hY 'ZU]`. 'B #5

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8YhJ]`g.hJ_Y!\ca Y`Ugg][ba Ybh

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

H\Y`ZbU``Ugg][ba Ybhk]h\`]bj c`j Y`U'WgY`gh XmUbX`h\Y`gh XYbhg`k]``bYYX`hc`dfcj]XY`h\Y]f`UbU`mg]g`]b`h\Y

5 https://bxubwww.Fyei]fYaYbhg

 $\hbox{Ghi XYbhg'UfY'ghfcb[`m'YbWc'i fU[YX'hc'UhhYbX'U```WUggYg'UbX'fYj]Yk'``YWhfY'fY'WcfX]b[g''' } \\$

7ci fgY'GWXYXi `Y

J]Yk 'WUgg'h]a YhUV'Y

H]a YtUV`Y

8 UHY	Hmd Y	7 cbhYbh
C 'K YY', ': YVfi Ufm! '& : YVfi Ufm	Hcd]W	K Y`Wca Yž'UbX'UXa]b]glfUlij Y'lfci V`Y!g\ccli]b[
K YY_'%'%) ': YVfi Ufm!'%- : YVfi Ufm	Hcd]W	CjYfj]Yk cZh\YbiWYUfZY`WWWY"A]b]b[UbXa]`]b[
K YY_'&.'&&': YVfi Ufm!'&* : YVfi Ufm	Hcd]W	7 cbj Yfg]cb'hc'l: *'UbX'Ybf]W\a Ybh
K YY_'' .'%'A UfWX'!') : YVfi Ufm	Hcd]W	7 cbj Yfg]cbihcil C&iUbXibi WYUfiZ YiiZUVf]WUh]cb
K YY_'(.', 'A UfW\'!'% A UfW\	Hcd]W	7 i ffYbhUbX Z h fY bi WYUf Z Y`g"
K YY_') .'%) 'A UfWX'!'%- A UfWX	Hcd]W	I gYX'Z Y``ghcfU[Y`UbX`fYdfcWYgg]b[
K YY_'*.'&&'A UfW\'!'&* A UfW\	Hcd]W	Bi WYUf]nUh]cb^cZdfcWYggYg
K YY_'+.'&-'A UfW\'!'& 5df]`	Hcd]W	GYdUfUhjcb cZk UghY
K YY_', .') '5df]`'!'- '5df]`	Hcd]W	K UghYZcfa gʻUbXʻghcfU[Y
K_YY_'''&'5df]`'!''%* 5df]`	Hcd]W	K UghY`WcbX]njcb]b[žghcfU[Y`UbX`X]gdcgU`
K_YY_`%\$.`%_'5df]``!`&' 5df]`	Hcd]W	8YWcaa]gg]cb]b[žacb]hcf]b['UbX'fYaYX]Uh]cb

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%"6Ug]WBi WYUf'9b[]bYYf]b['5ih\cf.': cghYf'UbX'K f][\h €6B'-+,!\$&\$)\$+,,*, Di V`]g\Yf'5``mb'UbX'6UW¢b

&"Bi WYUf'7\Ya]WU``9b[]bYYf]b[' 5i h\cf. 6YbYX]WžD][ZcfXž@Yj] €6B'-+,!\$\$+\$\$()'%* Di V`]g\Yf'A W fUk!<]``

' "'7 ca dfY\Ybg]j Y'Bi WYUf'A UhYf]U`g 5i h\cf. Fi Xm? cb]b[g -€6B'-+,!\$\$,\$)*\$&+(MYUf'Di V`]g\YX'&\$%

&":Bi WYUf'9&Yf(jm:Df]bW]d`Ygž'dfUW]VWg'UbX'dfcgdYWg 5i h\cf.:8Uj]X'6cXUbg_m =66B'-+,!\$',+&\$++,\$ MYUf'Di V`]g\YX'&\$\$)

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 Ybhgi Va]gg]cbz'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 `\g`UfY`h\Y`d]bbUWY`cZU```mci f`\UfX k cf_'UbX`g\ci `X`VY`lfYUhYX`k]h\`Xi Y`fYgdYWf`DfYgYbh]b[`fYgi `\g`WYUf`m[]j Yg`h\Y`a Uf_Yf`h\Y`VYghW\UbW\ cZi bXYfgHJbX]b[`mci f`a Yh\cX/Yj Yb`]Zh\Y`bi a Yf]WJ``fYgi `\g`UfY`]bWcffYWf

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

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

D`YUgY'bchY'h\Uhghi XYbhg'k]``bch'VY'fYei]fYX'hc'dfcj]XY'Ubm'XcW'a YbhUfm'Yj]XYbWY'hc gi ddcfh'UVgYbWg'Zfca 'Ubm'WUggYg'a]ggYX'**VYWUi gY'cZ'7CJ=8!%** 'di V`]W\YU'h\ 'a YUgi fYg'gi W\'Ug]gc`Uh]cb"'| BGK 'k]``bch'VY']bg]gh]b['cb'a YX]WU`'VW'fh]ZJWUh'Yg'Zfca 'UbmcbY'XYYa YX'hc'VY'U'dcg]h]j Y'WUgYZ cf'k\Yb'h\Ym\Uj Y'fYWcj YfYX"'Gi W\'WYfh]ZJWUh'Yg'UfY'X]ZZJW 'hhc'cVhU]b'UbX'di h'Ub'i bbYWYggUfmghfU]b'cb ghi XYbhg'UbX'a YX]WU`'ghUZZ''

 $5\,dd^{3}WUhlcbg^{3}Zcf^{3}gdYW_{U}^{3}W^{3}bg^{3}XYfUhlcb^{3}k^{3}XYfUhlcb^{3}xYfUhlcb^{$

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

 $\label{thm:continuous} IBGK ``Ug`Ub`cb[c]b[`Wcaa] ha Ybhhc`ZcghYf]b[``U`W`hi fY`cZ`YUfb]b[`]bZcfa YX`VmUWUXYa]W]bHY[f]hm'`5``IBGK ``ghi XYbhg`\Uj Y`U`fYgdcbg]V]`]hmhc`UX\YfY`hc`h\]g`df]bW]d`Y`cZUWUXYa]W]bHY[f]hm'UbX`]g`bchhc`YfUhYX`UhIBGK "`B'SY[Sde_SfG@EI[e VWX]`WWSege[`YfZWiadVead[VWSeaXafZWbeS`VbSee[`YfZW_aXSekagdai`ž$

D`U[]Uf]ga i]g`U`ImdY`cZ]bhY``YWi U``I\YZI'`±iWUb`HU_Y`a UbmZcfa gžZfca 'XY`]VYfUhY`W\YUIJb[`Ic`UWJXYbHJ``m Wcdm]b[`Zfca 'U`gci fWYk]h\ci hUW_bck `YX[Ya Ybh'I BGK '\Ug`dfcXi WYX`U`k YVg]hY`k]h\ci hU'k YU`I\`cZ fYgci fWYg`Ic`gi ddcfhighi XYbhg`Ic`i bXYfgHJbX`UbX`Uj c]X`d`U[]Uf]ga žj]g]h`ghi XYbh'i bgk "YXi "Ui #J`U[]Uf]ga "H\Y`@YUfb]b[`7 YbhY`Ugq]ghg`ghi XYbhg`k]h\i bXYfgHJbX]b[`UWJXYa]W]bHY[f]mYUbX`\ck 'bchIc'd`U[]Uf]gY"

5 WUXYa]W = DZcfa Uhjcb

7 fYX]hdc]bhg

7 ci fgY'WfYX]h']g'WU'W 'UhYX']b'I b]hg!C Z 7 fYX]hfl C 7 L'''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'YhYžZcf'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_'fl* Ł'cZ gW.YXi 'YX'ZJWY!hc!ZJWY'UbX#cf'cb`]bY'WcbhJWf'5bmUXXJhJcbU''hJa Y'VYmcbX'h\Y'dfYgWf]VYX'WcbhJWh\ci fg g\ci 'X'VY'gdYbh']b'a U_]b['gi fY'h\Uhmci 'i bXYfghJbX'h\Y''YWh fY'a UhYf]U'ž'Wca d'YhJb['h\Y'gYh Ugg][ba YbhgžZ fh\Yf'fYUX]b['z'UbX'fYj]g]b['Zcf'UbmYl Ua]bUhJcbg"

Cb!WUa di g WUgg UHYbXUbW

Di V`]WX]gHJbW]b['W&bX]h]cbg'a i gh'VY'Zc``ck YX'Zcf'U```ZJWY!hc!ZJWY'WUggYg"'Hc Ybgi fY'h\]gžcb`mighi XYbhg Ybfc``YX']b'h\cgY'WUggYg'k]```VY'U``ck YX']b'h\Y'fcca "'7`Ugg'fcghYfg'k]```VY'UhtJW\YX'hc'WcffYgdcbX]b[fcca g'UbX'W]fW'`UhYX'Ua cb['`UV'XYa cbghfUhcfg"'Bc'cj Yf!Ybfc`a Ybh]g'U``ck YX']b'ZJWY!hc!ZJWY'WUgg" Ghi XYbhg'Ybfc``YX']b'cb`]bY'WUggYg'WJb'gk Ud'h\Y]f'Ybfc`a YbhZfca 'cb`]bY'hc'U``]a]hYX'bi a VYf'cZcb! WJa di g'WUggYg'VmGi bXUmž'K YY_'%"D`YUgY'fYZYf'hc'mci f'Wci fgYfg'A]WfcgcZhHYUa g'UbX'A ccX'Y'g]hYg'Zcf a cfY']bZcfa Uh|cb'UVci hWUgg'UhhYbXUbWY'Zcf']b!dYfgcb'UbX'cb`]bY'WUgg'gYWflcbg#JWflj]hJYg"

Mci f`\YU`h\`UbX`h\Y`\YU`h\`cZh\cgY`]b`mci f`WUgg`]g`Wf]h]WU``mi]a dcffUbh'`Mci 'a i ghighUm'Uh\ca Y`]Zmci 'UfY g]W_`cf`\Uj Y`VYYb`UXj]gYX`hc`gY`Z]gc`UhY`VmBGK_`\YU`h\`cf`[cj Yfba Ybh'Ui h\cf]h]Yg"'7 i ffYbh'U`Yfhg`UbX`U `]ghcZ\chgdchg`Wb`VY`Zci bX`\YfY"'Mci 'k]``bchVY`dYbU`]gYX`Zcf`a]gg]b['U`ZUWY!hc!ZUWY`UWN]j]hmXi Y hc`]``bYgg`cf`U`fYei]fYa Ybh'hc`gY`Z]gc`UhY"'K Y`k]``k cf_'k]h\`mci 'hc`Ybgi fY`Wcbh]bi]hmcZ`YUfb]b['Xi f]b[mci f`]gc`Uh]cb`UbX`\Uj Y`d`Ubg`]b`d`UWY`Zcf`mci 'hc`WUhW\`i d`cb`UbmWcbhYbh'cf``YUfb]b['UWN]j]h]Yg`mci 'a Um a]gg"`K\YfY`h\]g`a][\hbch'VY`dcgg]V`Yž`Ub`Udd`]WUh]cb`Zcf`ZYY`fYa]gg]cb`a UmVY`X]gWi ggYX": i fh\Yf]bZcfa Uhlcb`]g`Uj Uj`UV`Y`cb`UbmWci fqY`A ccX`Y`cf`HYUa q`q]hY"

 $\pm 0.000 \text{ which is a UbXinuvcfuhcfmig] high by Xincfin by Yincfin by Yinc$

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; i]XY`]bYg

5```ghi XYbhg`UfY`YI dYWhYX`hc`fYUX`UbX`VY`ZJa]`]Uf`k]h\`I BGK`[i]XY`]bYg`UbX`dc`]W\'g''`\d\dUfh]W\`Ufz`ghi XYbhg`g\ci`X`VY`ZJa]`]Uf`k]h\`H\Y`Zc``ck]b[.

- 5HYbXUbW
- I_BGK_'9a_U]`'5XXfYaa
- GdYWU`'7cbalXYfUhcb
- 91 Ua q
- 5ddfci YX 7 U W Uhcfa
- 5WUXYa 1W<cbYghmUbX'D'U[]Uf]ga_

a dcfhUbh'@]b_g

- A ccX`Y
- <u>@UV:5\W\/aa</u>
- < YU`h\`UbX`GUZY m</p>
- <u>7 ca di h|b[: UW|^]h|Yq</u>
- Gh XYbhF Ygci fWg
- 7 ci fgY 'Ci h]bYg
- 9b[]bYYf]b['Gh XYbhGi ddcfhGYfj]\Wg:7YblfY
- A U YfadUW
- I BGK 'H]a YHUV'Y
- I BGK '< UbXVcc
- I BGK 'A YVX Ub]WU`'UbX'A Ubi ZUWi f]b['9b[]bYYf]b[
- <u>9ei]hUV`Y`@YUfb]b['GYfj]WYg</u>

a U[Y'7fYX]h

GmbYf[]Yg^]b^GcibX^&\$%*

7F = 7CG

7F = 7 C G 'Dfcj]XYf '7 c XY. '\$\$\$-,;

5W_bck `YX[Ya YbhcZ7ci blfm

 $K Y : UW\underline{b} ck `YX[Y : h, Y : 6YXY[U : dY cd `Y : k \ c : UfY : h, Y : hfUX]h\underline{b} cb U : W ghcX]Ubg : cZh, Y ``UbXg : cb : k \]WX : I B G K ? Ybg]b[hcb : WUa di g :]g ``cWUhYX''$

5ddYbX]l. '9b[]bYYfg'5i glfU`]U'f95Ł'DfcZYgg]cbU`'9b[]bYYf'7ca dYhYbWm GHJbXUfX

Dfc[fUa '±bHYbXYX'@YUfb]b['CiHWca Yg	
?bck YX[Y'UbX'g_]``'VUgY	
DP9B5%% 71ca Cofo∀mpre joo000090osj jloo∀h/fä7lcaEdB/objeiovhh/be/be\WnCompetency	