



@YYžI G5 ! 5g'h\Y'j]VfUbWmcZ'gi a a Yf'UddfcUW\Ygž'@YY'<YU`h\
]g'fYUXm'hc'Ya VfUWY'h\Y'Wca a i b]hm'k]h\'YI W]h]b['ZYgh]j]h]Yg'Zcf
K cf`X'K Y``VY]b['K YY_"': fca '* bY'&' !' \$ž'h\]g'Ubbi U`
Yj Ybh WY`YVfUhYX'k cf`Xk]XY k]```ZcW' g'cb'\c`]gh]Wk Y``bYggž
Ybf]W\]b['`]j Yg'h\fci [\'j Uf]YX'dfc[fUa g'UbX'UWh]j]h]Yg''@YY
<YU`h\']bj]hYg'Yj YfmcbY'hc'hU_Y'dUfh']b'U'gYf]Yg'cZ'Yj Ybhg
XYg][bYX'hc'Vccgh'd\mg]WU`ž'a YbhU`ž'UbX'Ya ch]cbU``\YU`h\"

 $K\ cf`X`K\ Y``VY]b[\ K\ YY_'k\]``YbhYf']hg`Z]Zh\ mYUf`h\]g`ibY Wcbh]bi]b[\ hc`g\]bY`U``][\ hcb`YggYbh]U``UgdYWhg`cZ'k\ Y``VY]b[" CfW\YghfUhYX`hc`Wcj\Yf`Yj\Yfmh\]b[`Zfca`k\cf_'UbX`Z]bUbW]U` gYW'\f]hm`hc`\YU`h\`UbX`Ybj\]fcba\YbhU``WUfYž'h\]g`]b]h]Uh]j\Y`\Ug [\U]bYX`[`cVU``g][\b]Z]WUb\W\ž'YgdY\W]U``m`]b`U`dcgh!\dUbXYa\]Wk\cf`X$

 $k \ YfY'k Y``VY]b[\ `` \ Ug'VYWca Y'dUfUa ci bh" @YY'< YU`h\ g'UWh]j]h]Yg k]`` \ `cbcf'\YU`h\ 'k cf_Yfg'UbX'WUfY[]j Yfg'k \]`Y'dfca ch]b[``cWU` dfUWh]h]cbYfg'UbX'W\ Uf]h]Yg'XYX]WUhYX'hc'k Y``VY]b["$

91 W]h]b['9j Ybhg 5k U]h°

@YY'<YU`h\ '7cWcbi h'Dc]bh'k]```\cgh'Ub'UffUm'cZ'Yj Ybhg'U]a YX'Uh dfca ch]b['k Y``VY]b["'?]W_]b['cZZ'h\Y'k YY_'cb' \Rightarrow bY'&' ž dUfh]W]dUbhg'WUb' $^{\circ}$ c]b' < YY``hc'HcY.'7ca a cb'7Ui gYg'cZ': cch'/5b_`Y'DU]b 'Zfca '%\$!%%'U"a "'H\Y'Zc``ck]b['XUmg'k]```U`gc'VY dUW_YX'k]h\ 'Yb[U[]b['dfc[fUa g'gi W\ 'Ug.

- x bY &(. '@ bW / '@YUfb. 'Ghfcb[Yf'A]bXgž'<YU`h\]Yf'@]j Yg fBccb!%'d"a "Ł
- > i b Y '&* . '7 ca a i b]hm'C i hX ccf'7 \ U]f'Mc[U'fl: |%\$ 'U"a "Łž A]b X Zi ``F c W_g. '5 fh' Zcf' Mc i f'K Y ``VY]b['fl%\$! '%' U"a "Łž 7 cc_]b['8 Ya c. 'D`Uh]b['k]h\ '7 c`cf'fl') ž'B ccb! %'d"a "Ł
- > i bY'&+. 'G_]b'7UbWf'GWfYYb]b[g'fl-'U"a "!&'d"a "ž'WU'` &' -!(*,!\$\$) \$ 'hc'gWXYXi `YŁž'7ca a i b]hm'GhfYhWX ž
 6U`UbWfž/ 'GhfYb[h\'fl!%\$'U"a "Łž'H\Y'; fccj m'; fci d' A i g]WH\YfUdm'f%\$!%%'U"a "Ł
- xi bY'&, .'@YY'<YU'h\'K Y``bYgg'FYhfYUh'ff'*\$ž'UXj UbWY fY[]ghfUh]cb'fYei]fYXŁ"

A YUbk \]`Yž'K Y``K Um'7UdY'7cfU``k]```U`gc'c \mathbb{Z} Yf'ghUbXci h gYgg]cbgž']bWi X]b[.

- > bY'&'. 'Bihf]h]cb'k]h\'JU`. '6Y'A]bXZi`'cZ'Mcif
 Bihf]h]cbU`'KY``VY]b['f%\$!%%'U"a"Ł
- > i bY'&(.'K Y``VY]b[']b'9j Yfm'DU[Y.'8 #M6cc_a Uf_g'fi') ž
 -!%\$'U"a "Ł
- > bY'&*. '6ccgh]b['6fU]b'Dck Yf. 'H\Y'GdYYW.!@Ub[iU[YDUh\c`c[]ghg'; i]XY'hc'7c[b]h]jY'<YU`h\'fl.'\$!%\$.'\$
 U"a "Łž7UbWf!:][\h]b['GidYfZccXg.'K\Uh'hc'=bWiXY']b
 Mcif8]Yh'fl%%'U"a "!bccbŁ

; Yh'=bjc`jYX°

8 cb h'a]gg'h\ Y'W\ UbW\ 'hc'd Ufh]W]d UhY']b'h\ YgY'Ybf]W\]b[
UWh]j]h]Yg°K \Yh\ Yf'mci 'dfYZYf']b!dYfgcb'd Ufh]W]d Uh]cb'cf'j]fhi U`
cdh]cbgž'@YY'<YU'h\ 'UWWca a cXUhYg'U``'dfYZYfYbWYg"'Hc'`YUfb
a cfY'cf'hc'fY[]ghYfž'mci 'WUb'WcbhUWh'h\ Ya 'Uh'&' -!(*,!\$\$) \$'cf
Ya U]`'<YU'h\ m@]ZY 7 YbhYf4 @YY < YU'h\ "cf["'5XX]h]cbU``mž'h\ Y
Wca a i b]hm']g']bj]hYX'hc'U': fYY'7ca a i b]hm'Mc[U'9j Ybh'cb'\$ bY
&%'Uh'@U_Yg'FY[]cbU``DUf_ž']b'WY`YVfUh]cb'cZ' &hYfbUh]cbU``Mc[U
8 Um'' \$ gh'\YUX'cj Yf'hc'k k k "@YY < YU'h\ "cf[#Yj Ybhg'hc'fY[]ghYf
UbX'`cc_'Zcf' &bhYfbUh]cbU``Mc[U''8 Um'': fYY'7ca a i b]hm'Mc[U''

 $\begin{tabular}{ll} K cf`X`K Y``VY]b[`K YY_']g'U'dYfZYWh'cddcfhi b]hm'hc'ZcWi g'cb'k \begin{tabular}{ll} K cf`X'K Y``VY]b[`K YY_']b[`M'G'cb'gcW]U` a YX]U'i g]b[`h\Y'\Ug\hU[', k cf`Xk Y``VY]b[k YY_'UbX'[Yh]bgd]fYX'Vm'ch\Yfg'UWfcgg'h\Y'[`cVY'Ug'h\Ym'Yb[U[Y']b'h\YgY'j]hU` dfUWh]WYg''GhUfhYX']b'>\forall fgYmz'h\Y'Yj Ybh'\Ug'bck 'fYUWXYX'U k cf`Xk]XY'Ui X]YbW'z'g\ck WUg]b['h\Y']a a YbgY'[`cVU`'YZZcfh hck UfX'ZcghYf]b['\YU'h\'UbX'k Y``VY]b['Zcf'U``'' \\ \end{tabular} \label{fig:condition}$

@YY'<YU`h\`ghUbXg`cih`Ug`U`VYUWcb`cZkY``VY]b[`Xif]b[`h\]g]a dcfhUbh`kYY_"'A Uf_`mcif`WU`YbXUfgž`]bj]hY`mcif`Zf]YbXgž`UbX `Yhg`^c]b`hc[Yh\Yf`]b`dfcach]b[`U`\YU`h\]Yfž`\Udd]Yf`Wcaaib]hm°

cf'a cfY'XYhU]`g'UVci h'K cf`X'K Y``VY]b['K YY_ž'mci 'WUb'W]W_h\fci [\'hc'BUd`Yg'BYk gž'5k UfYbYgg'8 Umgž'cf'HYUa 'I d"

8 YhU]`g	
Cfh	@YYž'l G5
EiY``Yb	kkk"bUd`YgbYkg"Wca
	k k k "Uk UfYbYggXUmg"Wca
	hYUa i dd"]c

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