```
õEngcxg"vq"pq"hckvj"yjgp"hckvj"dtkpiu"dnqqf0ö"
! ! ! ! ! "!#$%&'$!()**+$,!!"#$%&'()*+#
```

 $Eqpukfgtcdng"tgugctej"qxgt"vjg"rcuv"vyq"fgecfgu"hqewugu"qp"vjg"kpłw-gpeg"qh"qticpk|cvkqpcn"ewnvwtg"kp"c"xctkgv{"qh"kpuvkvwvkqpcn"ugvvkpiu"*Cuj-mcpcu{." Yknfgtqo." ("Rgvgtuqp." 4222="Uejgkp." 3;:7="Vtkeg" ("Dg{gt." 3;;5+."kpenwfkpi"jkijgt"gfwecvkqp"*Mwj" ("Yjkvv."3;::="Vkgtpg{."3;:..".//012\cdot!3&+!45*'\$5\$6!+77+8\$4!97!4&5\$+:!;+*)+74!5<:!=5*'+4!)<!5<!9$>5<)-|cvkqp."uwej"cu"itgcvgt"kpuvkvwvkqpcn"cnkipogpv"cpf"ghLekgpe{"*Mqvvgt" ("Jgumgvv."3;;4="Vtkeg" ("Dg{gt."3;;5+"cpf"kpetgcugf"ucvkuhcevkqp"kp"yqtm"cpf"eqookvogpv"vq"vjg"qticpk|cvkqp"cpf"kvu"gzrtguugf"rwtrqugu"*Fgcn" ("?+<<+:6,!./@0A!?5<\+\$,!./B0A!?+\$4!:+!C\$)+4,!0DD.1!&5=+!\$+8+)=+:!E5\$-\$9\$4!\&5\$1.895*+48+!)<\$9!5!4&5\$+:!H9\$*:=)+H,!\&5\$1.9$\$1.9$\$1.5<!):+9*9>6!I#;\$5-xcpgn."3;:5="Iggtv|."3;86+."ecp"ecuv"c"fctm"ujcfqy"qp"kpuvkvwvkqpcn"nkhg0"J<!\&+!9<+!&5<:.!5!4\$9<>!):+9*9>6!85<!>'):+!5<:!\$+>'*5\$+!)<4\$\$'\$)9\$5\$!$$

8;4\$\$!"#\$,-'&./+\$-0\$1)2"#&\$34'(/5)-.

 $c"\,i\,tqw\,r"\,qh"\,c\,f\,j\,g\,tg\,pvu"\,{}^*\,J$

5!>\$+5%+\$!4+<4+!97!89FF)%F+<%1!5<:!89<=+64!5!4+<4+!97!F+5<)<>!5<:!;+*9<>)<>2

 $\label{eq:control_ent$

8;6\$\$!"#\$,-'&./+\$-0\$1)2"#&\$34'(/5)-.

 $\label{eq:control_equation} \mbox{$\$\&$+F:} 5!\&94\mbox{$\$:$} 97!4\mbox{$\$:$} + \mbox{$$>$$} \&4!5 \mbox{$<::::$} !H+5L \mbox{$<+44+4,!544+\$4!5} \mbox{$<::::$} 647' \mbox{$<8\$$}) 9 \mbox{$<5^*:} \mbox{$\$$$}) \mbox{$\$:$} 12!$

 $[\$9 'E4! F56! 5\% + FE\% !\%9! :) 489 = +\$! H\&) 8\&! E+\$49 < ! 19\$! E+\$49 < 41! 5\$ +! 89 = +\$\% + 6! + <>5>) <>!) <! E\$948\$) ; +: !; +&5 =) 9\$!) <! 5 <! +779\% !\%9! F) \%) > 5\% +! 7' $\%\& +\$! :5 <> +\$!\% 9! \%& +! 89 FF' <) \%6! N\& + <! 5! 8' *E$) \%!) 4! 4' 4E + 8\% +: ,! \% 94 +! 4 + L) <>!\% 9! cuuk i p" dnc o g"qhvgp" fq"uq"kp"c" o cppgt" ecnewncvg f"vq"kp l wgpeg" eq o o wpcn" 89 < 4 < 4' 4! $+>5$:) <>!\% +! 8&5 $58\% +$!9$! F9$5*) \% 6! 97! \% +! 4' 4E + 8\% +: !977 + <: +\$! Kppwgp fq"cp f"uwurkekqp" ftkxg"uwej "gxgpvu0" Kp" y kvej "j wpvu." vjg" eqpugpuwu")\% 4 + 7 P \% +!89 ** +8\%)= +! F+5 <> !F5L) <>!5 ;9' \%! += +<\$4 P; +89 F+4! \% +! +=) :+ <8 +! \% 5\%! 89 <=) 8\% 42! 3&9' >&!) <:) =): '5 *!) <8): +<\$4! 97! \% \% 4! 49 \%! F56! *99L! 49 F+H \% 5\%!:) 77 + $+ <\$!5\%! =5 \$9' 4! F9 F+ <\$4!) <!\$0 \$4\%9 \$6, !\% +!; 54) 8!\$ + <+\$4!97! \% +! dgjcxkqt" ctg" uvtkmkp in {"uk o knct0" Cu" Nwv | "rqkpvg fn {"pqvgu." y kvej / j wpvkp i" +0) 4\%!\$9: 56! >! F' 8\%!\$ +!45 F+!79 \$F!54! F9$ +-:) 4\%5 \\%! \$0 \$9$$ $8. $1 \ 0 FE* +4! uwej "cu" OeEctv j { ku o "qt" vjg" Ucng o "vtkcnu0"$

%&'()*+#\$<.)=#&:)5>

 $\label{eq:vjg} Vjg"ecug" rtgugpvgf"jgtg"fguetkdgu"c"ykvej"jwpv"cv"Etwekdng"Wpkxgt-4)\%6,!5!4F5**,!E\$)=5\%+!75)\%&-;54+:!89**+>+2!3&+!8\$)4)4!85F+!\%9!5!\&+5:!57\%+\$!\\ kv"ycu"ngctpgf"vjcv"Etwekdng\(\phi u rtgukfgpv"citggf"vq"cp"cnvgtcvkqp"kp"vjg">\$5:+!E9)<\%!5=+\$5>+!97!5!4\$5\$!5\\&*+\%+,!H&)8&!5**9H+:!&)F!\\%9!89<\%)<'+!\\%9!E*5\\&2\$2\$3&)4!58\%)9<!4E'\$+:!5!4';4+R'+<\%!89<7\$9<\\\$5\$9'E!97!)<-1 wgpvkcn"ugpkqt"hcewnv{"ogodgtu"yjq"ygtg"fggrn{"eqpegtpgf"cdqwv"vjku"E\$+8+:+<\%!5<:!)\\%4!+77+8\\%!9<!585:+F)8!)<\%+>\%62$

 $\#!: ++E+\$! +05F) <5\%)9 <!97! +=+<\%4,! &9H+=+\$,! \$+=+5*4! \% &5\%! \% \&+!) <8): +<\%! +0E94+: !*9<-4\%5<:) <>!\%+<4)9<4!\% &5\%! &5: !: +=+*9E+: !5\%! \% &+!) <4\%) \%'\%)9 <!\$+->5\$:) <>!\%4!7' \%' \$+!:) \$+8\%)9 <2!3 &+!854+!: +48\%); +4!\% +!79\$F5\%)9 <!5<: !: +\%5)*4! \\ yig"tgurqpugu"qh" yyq"kpł wgpvkcn"kfgqnqikecn"ecoru."dqvj"qh" yjkej"uqwijv" \\ vq"tqqv"qwv" vjg"ecwug"qh" vjg"kpuvkvwvkqpøu"knn"hqtvwpg"d {"fgoqpk|kpi"cpf"pgwvtcnk|kpi"vjg"qvjgt0"Gcej"itqwr"ycu"kpł wgpegf"d {"c"nctigt"qticpk|c-\%)9 <5*!8'*\'\$+,!9 <+!\\&5\\!=5*'+:!\\&+!75\\\&-;54+:!F)44)9 <!97!\\&+!) <4\\\\'\\%'\%)9 <!$

 $+=+\$,! \% \$5\%! H+! \$5:!'<89=+\$+:! H \$5\%! K5\%! 9<! I. // D1!:+48\$); +4!54!5<! S)<79\$-0 cvkqp/tkejö"ecug"*r0"38; +0"Vjg"hqnnqykpi"vjtgg"swguvkqpu"kphqtogf"qwt"kpswkt{"cv"Etwekdng"Wpkxgtukv{<"$

- .2! Jqy"fkf"xctkqwu" ogodgtu"qh"vjg"Etwekdng"eqoowpkv{"*g0i0."cf-F)<)4%\$5%9\$4,!4%577,!5<:!758'*%6!F+F;+\$41!F5L+!4+<4+!97!%&+!89<-%+<%)9'4!+=+<%4!%&5%!'<79*:+:\
- Z2! Kp" y j cv" y c { "fkf"vjg"g o gtigpeg"qh"vyq" fkuvkpev"dgnkgh"u { uvg o u"kp-łwgpeg"vjg"wpkxgtukv { øu"tgurqpug"vq"vjku"etkukuA

7#5"-4:

Cu" Gfict" Uejgkp" *3; ;8+" jcu" pqvgf." vjg" nkvgtcvwtg" qp" qticpk | cvkqpcn" 8'*%'\$+!<++:4!F9\$+!\$)8&*6!:+%5)*+:!854+!4%':)+4!%&5%!\$+=+5*!&9H!<9\$F4! cpf"xcnwgu"kpłwgpeg"vjg"yqtmkpiu"qh"qticpk|cvkqpu0" I kxgp"vjg"eqorngz-)\\(\)6!97!\\\&)4!E\&+<9F+<9<,!5<::!5;4+<8+!97!+FE)\\\$)85*!H9\\L!9<!\\\&+!<+>5\\)=+! k o rnkecvkqpu"qh"qticpk|cvkqpcn"kfgqnqi{."yg"gornq{gf"swcnkvcvkxg"ogvjqfu0" Fcvc" icv j gtkpi "dgicp" d{ "kfgpvkh{kpi "cp"kpkvkcn"uwdugv" qh"kpfkxkfw-5*4!\&5\\!89'*:!E\\$9=):+!5!\\$5<>+!97!E+\\$4E+8\\)=+4!9<!\\&+!+=+<\\4!\\&5\\!H+\\$+! '<79*:)<>!>)=+<!\\&+)\\$!:)4E5\\5\\+!\\\$9*+4!9<!85FE'4!I)2+2,!5:F)<)4\\\5\\9\\4.! 4\\(577,!5<::!758'*\\(6!F+F;+\\$421!\#7\\+\\$!:+=+*9E)<>!5!H9\\(L)<>!'<:+\\$4\\(5<:)<>! 97!H&5\\!H54!988'\\$\)<>.!H+!:+=+*9E+:!9'\\$!)<\\+\\$=)+H!E\\$9\\\989*42!J<+!97!'4! IG5\$\$\\41!=\4\\\+:!85FE'\4!5<::!89<:'\8\\+:!\\&\+!0.!\>\\\+\$=\)\+\\4!79\$!\\&\\4\\':6\! H&)8&!)<8*':+:!+)>&%!758'*%6!F+F:+\$4!I]'<)9\$!5<:!4+<)9\$1,!4+=+<!5:-F)<)4%\$5%9\$4,!%&\$++!4%':+<%4,!5<:!%&\$++!89FF'<)%6!*+5:+\$42!3&+!*+<>%&!97! 4+\$=)8+!5\\\\&+!)<4\\\\'\\)9<!\\$5<>+: !7\\$9F\\\H9!6+5\\4\\\9!<+5\\6\!ZD!6+5\\4\\\\\&! o quv" jcxkpi" y qtmgf" v jgtg" crrtqzk o cygn{"37" { gctu0" Y g"uqwi jv" vq" kfgp-%)76!)<:)=): '5*4!H)%&!5!\$5<>+!97!E+\$4E+8%)=+4!\$+>5\$:)<>!%&+!+=+<%4!;54+:! qp" vjgkt" xctkqwu" tqngu" qp" ec o rwu0" Etwekdng" tgnkgu" qp" vjg" uwttqwpfkpi" 89 F F '<)\\\6!79\\\14 'EE9\\\!5<:!4\\\':+<\\4!\\+5:)<>! '4!\\\9!)<\\+\\\=)+H!\\\&+!\\\&\\+! 89 F F '<)\\6! F+F; +\\$42! N)\\&!\\&+!+08+E\\)9<!97!\\&+!; 95\\\$: !97!\\\\\\$' 4\\++4!IH\&)8\&! $8\&+8L+:!:'\$)<>!4';4+R'+<\%!)<\%+\$=)+H4,!5<!+05FE^*+!97! \%&+!S9=+\$^*5E! ogvjqfö"*Nkpeqnp" ("Iwdc."3;:7+0"Kp"guugpeg."vjg"kpvgpv"qh"vjg"rtqvqeqn" H54!\%9!'<:+\$4\$5<:!\%+!+=+<\$4!5<:!E+\$8+E\%)9<4!97!=5\%)9'4!E5\%)8)E5<\$4!)<!qtfgt"hqt"wu"vq"wpfgtuvcpf"vjg"gh\{\perceq}ece{"qh"vjg"ykvej/jwpvkpi"htcogyqtm0" #::)\%)9<5\$!<5F+4!H+\$+!49\$)\%+:!7\$9F!+58\&!E5\%)8)E5<\$,!5!=5\$)5\%)9<!97! vjg"upqydcnnkpi"qt"ejckp"vgejpkswg"*Dqifcp" ("Dknmgp."3;;4="Rcvvqp.".//D12!$

 $H+\$+!E5\$\%8'*5\$^*6!89<8+\$<+:!H)\%&!8*+5\$^*6!'<:+\$4\%5<:)<>!&9H!E5\$\%8)E5<\%4! \\ 7+**!)<\$9!\%&+!\%H9!85FE4!5<:!&9H!%&)4!E$98+44!988'$$+:2!#*\%9'>&!E5$-\%8)E5<\%4!F5:+!4+<4+!97!%&+!+=+<\%4!)<!4\%)L)<>!:)77+$+<\%!H564,!\%&+$!+154! \\ 4';4\%5<\%)5*!5>$++F+<\%!5;9'\%!H&5\%!58\%'5**6!988'\$+:2!3&)4!)4!E+$&5E4!<9\%! uwtrtkukpi"ukpeg"Etwekdng"ku"qh"vjg"uk|g"vjcv"oquv"qh"vjg"mg{"rnc{gtu"*cf-okpkuvtcvqtu."uvchh."cpf"hcewnv{+"mpqy"gcej"qvjgt"ygnn0"Kv"ku"pqv"c"nctig." 89FE*+0!'<)=+$4)\%62!$

! "#\$%& '()*+#\$<.)=#&:)5>\$%/:#

 $uvchh."dwukpguu"qhŁeg"hqnmu."cpf"vjg"hcewnv{0"Vjg"hcewnv{"fkf"pqv"igv"ucddcvkecnu"cpf"yg"fkf"pqv"qhhgt"yjcv"K"yqwnf"ecnn"c"wpkxgtukv{"gfwecvkqp0"Jg"fkf"5!;)>!]9;P5!>$+5%!]9;,|$+5**6P)<!\$5<479$F)<>!\42

 $\label{eq:continuous} $$M9F+!97!K\$+4):+<\$!K5\$$)4\!!+5\!*6!)<)\",05\",0=+4!)<8\":+:!\!\&+!4'88+447'\!!:+=+*-qrogpv"qh"c"tcpig"qh"rtqLvcdng"ocuvgtu"fgitgg"rtqitcou."vjg"gzrcpukqp"qh"vjg"fgxgnqrogpv"qhLeg"cpf"c"itqyvj"kp"hwpftckukpi."cpf"tgpqxcvkqpu"vq"Etwekdng\[\phi\]u"dwukpguu"uejqqn0"Uwej"ghhqtvu"qxgt"vkog"jgnrgf"vjg"kpuvkvw-vkqp"tgickp"kvu"Lpcpekcn"hqqvkpi0"Cu"vjg"fgcp"qh"cecfgoke"chhcktu"rqkpv-+:\[\phi\]6!<9\!+:\[\phi\]5\!\9-!\]F\E\$9=+:\[\phi\]5\!\&+\$!:\[\phi\]5\"\85\".$

 $b\$9 F!\%\&+!=)+HE9)<\%!97!9\%\&+\$!758'*\%6! F+F;+\$4,!K5\$)4! F5:+!\%\&+!:+8)-4)9<!\%9! F9=+!79\$H5\$:!H)\%\&!*)\%*+!+=):+<\%!5<5*64)4!5<:!<9!:)48'44)9<!9\$!:+;5\%+2! Q=+<!\&)4!4' EE9\%+$4!58L<9H*+:>+:!K5\$)4\%!58\%)9<4!H+\$+!'<)*5\%-gtcn0"Cu"cp"cfokpkuvtcvqt"enctk\Lgf."õK"fqpøv"ycpv"vq"ukv"jgtg"cpf"okungcf"cpf"uc{"vjcv"vjgtg"ycu"c"nqv"qh"kprwv"htqo"qvjgt"rgqrng0"K"fqpøv"vjkpm"$

BDO\$\$!"#\$, - '&. /+\$-0\$1)2"#&\$34'(/5)-.

 $\label{lem:condition} $$ v = rqn + y = rqn$

K\$98\\9\$!:+>5<!:6!>5\\&+\$)<>!\\9>+\\&+\$!\$5!>\$9'E!97!\\&+!F94\\!\$+4E+8\\+:! 585:+F)8)5<4! 9<! \\&+! 85FE' 42T! G)4! >95*! 79\$! \\&+! >\\$9'E! H54! \\\9! S:+5*! y kvj"vjku"dghqtg"vjg" PECC"eq o gullö"Uq o g" o g o dgtu"qh"vjg" i tqwr" j c f"c" *9<>4%5<:)<>!5<:!=+\$6!>99:!H9\$L)<>!\$+*5%)9<4&)E!H)%&!%&+!E\$+4):+<%2!#! <'F;+\$!97!%&+F!&5:!4'EE9\$%+:!5<:!5EE*5':+:!&)4!+779\$%4!%9!+0E5<:!%&+! >\$5: '5\\+!E\\$9>\\$5F42!N&\+<!\\&\+!>\\$9'E!F\\\\,!K\\\$9\\\9\\!\\\\\9\\:!\\\&\+F!5;9'\\!\\\&\+! E\$+4):+<\\\\4!:+8)4)9<!\\9!8&5<>+!\\&+!4\\5\!5\\&*+\\+\\4! \G+!5\\>'+:!\\&5\\! Etwekdng" y cu"kp"c"õfktg"ukvwcvkqpö ô o cvgtkcnn{"dgecwug"qh"v j g"k o rgpfkp i" PECC"kpxguvkicvkqp"cpf" o qtcnn{"dgecwug"Rcttku"jcf"ycpvqpn{"xkqncvgf" eqtg"kpuvkvwvkqpcn"xcnwgu"d{"ucetkLekpi"kpvgitkv{"qp"vjg"cnvct"qh"cvjngvke" 4'88+442!#4!9<+!758'*\6!F+F;+\$!\$+85**+:,!5\!\\&+!+<:!97!\\&+!F++\\)<>,!\$N+! H+\$+!5**!'<5<)F9'4!%&5%!H+!&5:!%9!5::\$+44!%&+!4)%'5%)9<!)FF+:)5%+*62T!J<+!4'>>+4\|+:!\\&5\\!\\&+6!\\5L+!5!48\)E\|'\\$5*!5EE\\$958&!\\9!\\$+49*=)<>!\\&+!4\\\'-5\|)9<!;6!F++\|)<>!H)\|\&!\|\&+!E\|+4):+<\|,!*56)<>!9'\|\|\&+)\|\89<8+\|<4,!4++L)<>! jku" tgrgpvcpeg" cpf" tgeqpeknkcvkqp0" Swqvkpi "vjg" Pgy "Vguvc o gpv" jg" gz-E*5)<+:,

M'8&!5!F++\(\)\(\)!H9'*:!E\(\)9=):+!5\<!9EE9\(\)\'\(\)\\(\)6!\\(\)9!\<9\\!9\\\\^86!5::\(\)\$+44!\\\\\\\\)!

%9'4!H54!5%!&5<:!;+>5<!%9!4E\$+5:2!U6!%&+!%)F+!%&+!F++%)<>!89<=+<+:!vjcv"chvgtpqqp."vjg"cw fkvqtkw o "ycu"Lnngf"vq"pgct"ecrcekv{0"Vjg" o ggvkpi"qrgpgf"ykvj"uq o g"eqphwukqp"tgictfkpi"vjg"urgekŁeu"qh"vjg"cvjngvke"fg-E5\$%F+<%!)44'+42!#!E\$97+449\$!7\$9F!%&+!>\$9'E!H&9!5EE\$958&+:!%&+!E\$+4)-:+<%!H&9!5%%+<:+:!%&+!F++%)<>!:+48\$);+:!%&+!48+<+`

 $\label{eq:continuous} $$ Kv" y cu"xgt{" fkhŁewnv0"V j gtg" y gtg"ugxgtcn"hcewnv{" o g o dgtu"v j gtg"v j cv"mpg y " pqv j kp i "qh" y j cv" y cu" i qkp i "qp0"V j g{" j c f" pqv"gxgp" tgc f"v j g" rcrgt0" K"v j kpm" y g" eqwn f" j cxg" fqpg" c" dgvvgt" lqd" qh" i kxkp i "v j g o "uq o g" dcem i tqwp f0" K" tg-cm{"ecpøv"guvk o cvg" j q y " o cp{"mpg y0"V j g"tw o qt" o km" j c f"dggp" } { kp i 0" O quv" } $$$

Rtqevqt"ncvgt" o ckpvckpgf"vjcv"vjg"e

2=

 $\$+7+\$+<8)<>!5!E';*)8!4\%5\%+F+<\%!H\$)\%\%+<!;6!\%\&+!;95\$:!8\&5)\$2!\#*\%9'>\&!\%\&+! dqctf"gzrtguugf"kvu"hwnn"eqpŁfgpeg"kp"vjg"rtgukfgpvøu"ngcfgtujkr."vjg{"}<:)85\%+:!)<!5!E\$+44!\$+*+54+!%&5\%!S%\&+6!H9'*:!;+>)<!5!7'**!5<:!%&9$9'>\&!$<)<=+4\%)>5\%)9<!97!5**!5**+>5\%)9<4!5<:!%&+!58\%)9<4!%&5\%!&5:!;++<!\%5L+<!)<!\%&+!$$ hcewnv{"oggvkpi0ö"Vjg"dqctf"cnuq"crqnqik|gf"vq"vjg"cvjngvg"cpf"jku"hco-)*6!79$!5<6!+F;5$\$544F+<\%!85'4+:!&)F!;6!\%&+!\$+8+<\%!5**+>5\%)9<42!3&+!79*-nqykpi"fc{"vjg"vtwuvggu"jktgf"c"ncy"\Lto"vq"dgikp"cp"kpxguvkicvkqp0$

3&+!4+<)9\$!758'*\$6!H&9!&5:!\$5)4+:!\$&+!89<8+\$<4!5<:!\$5%+\$!8&5FE)9<+:! vjg"pq"eqp&fgpeg"xqvg"ycu"kpetgfwnqwu"yjgp"vjg{"jgctf"qh"vjg"vtwuvgguø" 5EE5\$+<\!'<+R')=985*!4'EE9\$\!79\!K5\\$)42!3&+6!H+\\$+!5*49!4&5L+<!H&+<!C"vgco"qh"ncy{gtu"fguegpfgf"qp"ecorwu"eqpfwevkpi"fq|gpu"qh"kpvgt=)+H4!)<!9\\$:+\\$!\\$9!E\\$+E5\\$+!5!\\$+E9\\$\!79\\$!\\$&+!\\$+>'*5\\$6!48&+:'*+:!\\$'4\\$++!F++\\$)<>,!H&)8&!H54!988'\\$\\$)<>!\\$&+!79\\$9H)<>!H++L2!3&+!\\$+>5\\$!\\$+5F!+0-5F)<+:!+F5\\$!5889'<\\$4!97!\\$&+!4+<)9\\$!758'\\$\\$6,!)<79\\$F)<>!\\$&+F!9<\\$6!57\\$+\\$!\\$\\$\\$6!55\\$\\$+\\$!

 $pkv \{ "ngc fgt" gzrnckpg f." \~o Køxg" mpq y p" Lqjp" Rtqevqt" hqt" c" nqp i "vk o g0" J ku" kpvg i tkv \{ "ku" dg \{ qp f" tgrtqce j 0 \"o "Kh" Etwekdngøu" uvw fgpvu" j c f" kp" v j g" rcuv" dggp" $+*5 \%) =+*6! :98)*+,!%&+6! <9H! ;+>5 <! E$9 \%+4 \%) <>! $)>& \%!9' \%4):+!97! \%&+!E$+4)-fgpvøu" qhŁeg0" Vgngxkukqp" etg y u" ł qemg f" vq" v j g" u o cnn" vq y p." ftc y p" d { "v j g" 4E+8 \%58*+2! N) \%&!E$+44' $+!F9' < \%) <>!7$9 F! %&+!758' * %6!5 <: !E5$+< \%4,!5*' F <>)! cpf" nqecn" ekvk | gpu." v j g" vtwuvggu" ecnng f" c" ur gekcn" o ggvkp i "hqt" Htkfc { ." rtg-8)4+*6! \%H9! H++L4!57 \%+$! \%+! \%+! F++\%) <>!H&+$+! \%+6! \%5:!:+F9 \%+:! K$98 \%9 \%2!$

 $\label{eq:convergence} $$K''c o ''uqtt{"vjcv"yjcv"K''fkf''qwv''qh''hcktpguu''vq''c''uvwfgpv''jcu''ngf''vq''uwej''eqpvtq-xgtu{0"Dwv''K''c o '' oqtg''uqtt{"vjcv''vjg''jct o''kpłkevgf''qp''Etwekdng''Wpkxgtukv{"vjg''rcuv''hgy''ygmu''jcu''dggp''ugnh/kpłkevgf''d{'' ogp''cpf''yq ogp''qh''vjg''Etw-8);*+!89FF''<)\6!\9!\&+!:+\$)F+<\!!97!9'\$!4\$':+<\$4!H&9!H+!5\$+!&+\$+!\9!4&9H!$

 $\label{eq:continuous} $$ \%.5\%!\%+!:+9*9>+4,!H\&)*+!'E\&+*:!;6!8+\$\%5>!S758\%4,T!5\$+!89<4\%'8\%+:!;6! \%.4+!)<+$$ E$+\%5\%9<!97!\%+!+=):+<8+2!3&'4,!4'EE9\%+$4!97!\%+!E\$+4):+<\%!E9>\%+:!\%9!>5)<4!)<!5:F)44)9<4!4\%5\%4\%184,!F9\$+!7'<:\$5)4)>>,!5<:!\%+!8\$+-cvkqp"qh"c"xkcdng"Fkxkukqp"K"rtqitco"cu"gxkfgpeg"hqt"jku"gh&ecekqwu"ngcf-gtujkr0"Fgvtcevqtu"wugf"vjg"ucog"ugv"qh"hcevu"cu"gxkfgpeg"qh"pctekuukuvke"S4\%)=)<>2T!#<!):+9*9>6,!\%+$+79\$+,!)4!5!&)>&*6!\<%+$E\$+\%)=+!H9\$*:=)+H2$

 $\label{eq:vjcv} Vjg"Etwekdng"ecug"fgoqpuvtcvgu"vjg"rqvgpvkcnn{"fguvtwevkxg"rqygt"vjcv"): +9*9>)85**6!:)=)4)=+!89<7$9<\$5\)9<!85<!&5=+!9<!5<!)<4\)\%'\$)9<,!E5\\$\)8'-*5\$*6!H&+<!E9H+$7'*!+<\\$\)\)+4!4'8&!54!\&+!E$+4):+<\\$!8&5)$!97!\&+!;95$:!qh"vtwuvggu."qt"ugpkqt"hcewnv{"ctg"kpxqnxgf0"Kfgqnqikecnn{"ftkxgp"fgdcvgu"*+5=+!*\\%*+!$99F!79$!F9:+$5\\+4!9$!7+<8+-4)\\%+$4!H&9!F)>&\\$!9\\&+$\$H}4!;+!vjg"uqwteg"qh"eqpeknkcvqt{"fgekukqpu0"Kp"vjku"yc{"vjg{"rwuj"eqoowpkv{"F+F;+$4!\\$9!9EE94)*+!<:4!97!\\&+!):+9*9>)85*!4E+8\\$'F!H&)8&!)<*+<4)=+4!cp"gxgt/ykfgpkpi"urktcn"qh"fkxkukxgpguu"hwgngf"d{"|gcnqvt{0"Yjcv"ku"rct-\\$)8'*5\\$6!<9\\+H9\\&6!\)4!\\&5\\!:+4E)*+!\\&+\)$!'<:+\\$6\<>!:)77+\$+<8+4!\>!\\&+!5\\$1+2\\$1+2\\$1+2\\$1+2\\$1+2\\$1+2\\$1+3\\$1+3\\$1+3\\$1+3\\$1+3\\$1+4\\$1+2\\$1+4\\$1+3\\$1+3\\$1+4\\$1+4\\$1+4\\$1+$

É" *M-5"*\$(/@;:\$*A#&#*\$(-.(#&.#*4*\$/*-'5\$5"#\$#N5#&./+\$;#&(#;5)-.:\$-0\$5"#\$). *G*:5)5'5)-. K\$Q58&!>\$9'E!;+*)+=+:!\&5\\\&+!58\\)9<4!97!\&+!9\&+\\$!<+>5\\)=+*6!
)FE58\\+:!\&+!\$+E'\\5\\)9<! 97!\\&+!)<4\\\\'\\)9<! 54! 5<!+0+FE*5\\!97!\75\\\&;54+:!\&)>&+\\$!+:'85\\)9<2

É" ?\$:"/\$A - &+4=)#A\$-&\$)4#-+-2>\$4&-=#\$#/("\$(/@;\$/.4\$;&-=)4#4\$0':5)6

Lecvkqp"hqt"cevkqpu"qp"oqtcn"itqwpfu<!39!\&+!4+<)9\$!758'*\\6!F+F;+\\$4,!
\\&+!E\\$+4):+<\\!+<>5>+:!)<!)FF9\\$5*!;+&5=)9\\$,!H&)8&!\\$+R')\\$+:!&\F!\\9!
\$89F+!79\\$H5\\$:!\\9!\\$+E+<\\2T!b\\$9F!\\&+!E+\\$4E+8\)=+!97!\\&+!E\\$+4):+<\\!5<:!

 $\label{eq:total control of the con$

fgxqvggu"cu"õswcuk/o {vjkecn"jgtqguö"*Og{gt."3;:4."r0"82="Enctm."3;94+0" Vjg"ktqp{."cu"kp"vjg"ecug"qh"Etwekdng."dgeqogu"vjg"rgtegrvkqp"qh"qrrqu-)<>!>\$9 'E4!9\$!<9<-;+*)+=+\$4!H&9!89<4):+\$!\\&+!*+5:+\\\$4\\!58\\)9<4!54!)89<qencuvke"cpf"fgvtkogpvcn"vq"qticpk|cvkqpcn"iqcnu0"Vjg"tguwnvkpi"eqp1kev" 9=+\$!\\&+!*+5:+\\$4!7'\\\&+\\$!+058+\\$;5\\+4!\\\&+!:)77+\\$+<8+4!;+\\H++<!\\&+!89FE+\\- $\verb"kpi" x \verb"kg y u0" N \verb"wv | "*3; :: +" fguetkdgu" c" y \verb"kvej" cu" \~o wuwcnn { "octikpcn" qt" y gcm" | permonent | permonen$ E+\$49<4!H)\\&9'\\!4\\\$9<>!E\\$9\\+8\\9\\$4T!IE2!ZZV12!G9H+=+\\$,!\\&+!+05FE*+!97! Etwekdng"ujqyu"vjku"ku"pqv"c"pgeguuct{"tgswktgogpv"cpf"kpfggf"oc{"pqv" jqnf"vjg"ukipkLecpeg"Nwv|"eqpvgpfu0"Oqtg"kp1wgpvkcn."rctvkewnctn{"cu"vjg" eqpłkev" i tqy u. "ku" v j cv "gcej "ukfg" dgeq o gu "kpetgcukp i n { "gpvtgpejgf" vq" v jg" rqkpv" v j cv" r cuv" kpuvkvwvkqpcn" qt" kp f kxk f wcn" uweeguu" r tqxgu" kpuwhŁekgpv" vq" ;\$):>+!\\&+!>'*7!;+\\H++<!\\&+!:)4E5\\\$5\\+!):+9*9>'+42!3\&+!9<\\6!\\\$+49\\\\)9<! vq"vjg"eqp1kev"ku"hqt"vjg"eqoowpkv{"vq"gnkokpcvg"vjg"ykvej"vq"tgguvcdnkuj" qtfgt0"Kp"vjg"gpf."dqvj"Rcttku"cpf"Rtqevqt"jcf"vq"dg"tgoqxgf"htqo"rqygt" %9!5EE+54+!;9%&!):+9*9>)85*!85 FE42!3&\$9'>&9'%!%&+!8\$)4)4,!+58&!97!%&+! ogp"jcf"dggp"uq"fgoqpk|gf"cpf"dgeqog"uq"eqpvtqxgtukcn"vjcv"vjg"qpn{" yc{"vq"tgfweg"vjg"eqpłkev"ycu"vjg"qwuvgt"qh"dqvj0"Vjku"cevkqp"gpcdngf" ;9%&!85FE4!%9!E*58+!;*5F+!54!<++:+:,!8*5)F!%&+!F9\$5*!&)>&!>\$9'<:,!5<:! ;+>)<!5!E\$98+44!97!\$+89<8)*)5\)9<2! J <8+!):+9*9>)85*!\\(58\)84!5\\(54!: 4+:,!5<! qpiqkpi"fcpigt"gzkuvu"vjcv"vjg{"oc{"dg"wvknk|gf"kp"hwvwtg"eqpłkevu0"Vjg" 49'\$8+!97!\&+!)FF+:)5\\+!E\\$9;*+F!5<::!8\\$)4)4!\&54!;++<!+\\)F)<5\\+:,!;'\\! F5<6!97!\\&+!'<:+\\$*6)<>!\\+<4)9<4!F56!4\\)**!\\$+F5)<2

938\$\$!"#\$, -'&./+\$-0\$1)2"#&\$34'(/5)-.

%-.(+':)-.

Q-5#:

0!#!E4+':9<6F!:+\$)=+:!7\$9F!#\$%&'\$!()**+\$W4!)<4)>&%7'*!E*56!9<!H)\%&-&'<\)<>,!!"#\$

 $\begin{tabular}{ll} $z'' Yg''' ctg'''' wukpi'''vjg'''vgto''''oykvejo'''cu'''cp''cpvjtqrqnqikecn''vgto0'''''kv'''ku'''pqv'''c''tghgtgpeg''' \begin{tabular}{ll} $9!5:&+$+<&4!97!&+!N\885<!$+*)>9<!H&9!F56!''4+!&$4!$+$F2!$$#::)%)9<5**6,!H)%&!)4!7$+-swgpvn{'''wugf''kp''c'' igpfgtgf''eqpvgzv.''dwv''vjku''ku''pqv'''pgeguuctkn{'''vjg'''ecug''kp''cp''qticpk|c-%)9<5*!H)%&&!&'<%2 \end{tabular}$

E#0#&#.(#:

- $\label{eq:continuity} Cdtexcpgn."J0"*3;:5+0"Ogfkcvqt{"o{vju"kp"vjg"ugtxkeg"qh"qticpk|cvkqpcn"kfgqnqi{0"Kp"N0"T0"}} \\ Rqpf{."R0"L0"Htquv."J0"Oqticp."("V0"E0"Fcpftkig"*Gfu0+."H&2/.)I/5)-./+$8>@*-+):@!IEE2! \\ 49564;5+0"Itggpykej."EV<"LCK"Rtguu0"$
- Cuj mcpcu{." P0" O0." Yknfgtq o." E0" R0" O0." ("Rgvgtuqp." O0" H0" *Gfu0+0" *4222+0" I /. 4*--R\$-0\$ -&2/.)I/5)-./+\$('+5'&#\$/.4\$(+)@/5#0"Vjqwucpf"Qcmu."EC<"Ucig"Rwdnkecvkqpu0
- $U+8\&+\$,132!I. /@/12!?(/4#@)(\$\&)*\#:\$/.4\$5\#\&\&)5-\&)\#: \&\&L.5\#+\#(5'/+\&\#.S')\&>\$/.4\$5''\#\$('+5'\&\#:\$-0\$-4):();+).\#:2!U\$)4\&9*, K\#^!JE+<!c<)=+\$4)\&6!K\$+442$
- Dgp/[gjwfc."P0"*3;:2+0"Vjg"Gwtqrgcp"ykvej"etc|g"qh"vjg"36vj"vq"39vj"egpvwtkgu<"C"uqekqnq->)4\\\4!E+\\$4E+\\$\)=+2!!"\%?@\\\\6\(/.\\$, '\&. /+\\$-0\\8-()-+-2>\6!TUI.1,!."Z.2
- U'\$<4,!f2! (2![2!I./B@12!D#/4#&:");0"Pgy"[qtm."P[<"Jctrgt"cpf"Tqy0
- $$\begin{split} & Eqnnkpu. "L0"E0." (\ "Rqttcu."L0"K0"*3\,;\,; 6+0"M\,') + 555-\$+/:5558\,' ((\#::0\,'+\$''/*)5:\$-0\$=):) .\,/\&>\$(-@\,;\,/.\,)\#:2! \\ & Pgy" [qtm." P [<"JctrgtEqnnkpu0"] + 2.555-8+/:55588\,' ((\#::0\,'+\$''/*)5:\$-0\$=):) .\,/\&>\$(-@\,;\,/.\,)\#:2! \\ & Pgy" [qtm." P [<"JctrgtEqnnkpu0"] + 2.555-8+/:55588\,' ((\#::0\,'+\$''/*)5:\$-0\$=):) .\,/\&>\$(-@\,;\,/.\,)\#:2! \\ & Pgy" [qtm." P [<"JctrgtEqnnkpu0"] + 2.555-8+/:55588\,' ((\#::0\,'+\$''/*)5:\$-0\$=):) .\,/\&>\$(-@\,;\,/.\,)\#:2! \\ & Pgy" [qtm." P [<"JctrgtEqnnkpu0"] + 2.555-8+/:55588\,' ((\#::0\,'+\$''/*)5:\$-0\$=):) .\,/\&>\$(-@\,;\,/.\,)\#:2! \\ & Pgy" [qtm." P [<"JctrgtEqnnkpu0"] + 2.555-8+/:55588\,' ((\#::0\,'+\$''/*)5:\$-0\$=):) .\,/\&>\$(-@\,;\,/.\,)\#:2! \\ & Pgy" [qtm." P [<"JctrgtEqnnkpu0"] + 2.555-8+/:55588\,' ((\#::0\,'+\$''/*)5:\$-0\$=):) .\,/\&>\$(-@\,;\,/.\,)\#:2! \\ & Pgy" [-] (-[-]$$
- Eqoctqhh."L0." ("Eqoctqhh."L0"*3;;5+0"7-4#&.)5>\$/.4\$)5:\$@/+(-.5#.5:K\$E)5'/+\$/.4\$;-A#&\$).\$;-:5(-+-.)/+\$?0&)(/0"Ejkeciq."KN<"Wpkxgtukv{"qh"Ejkeciq"Rtguu0
- $Fgcn. "V0"G0." ("Mgppgf \{."C0"C0"*3; : 4+0"\%-\&; -\&/5#\$('+5' \&\#: K\$! ''\#\&\&)5\#: \$/. 4\$\&)5' /+: \$-0\$(-\&; -6 \&/5\#\$+)0\#2! \\ d+5:) >>>,! (\#`!\#::)49<-N+4*+62$
- Fkm."F0"F0"*3;:4+0"Vjg" ocpcig ogpv"qh"cecfg oke"ewnvwtg<"Pqvgu"qp"vjg" ocpcig ogpv"qh" F+5<)<>!5<:!498)5*!)<%+>\$5%)9<2! 1)2"#&\$34'(/5)-.6!VVIZ1,!ZDZ"Z0D2
- I ggtv|."E0"*3;95+0"Vjkem"fguetkrvkqp<"Vqyctf"cp"kpvgtrtgvkxg"vjgqt{"qh"ewnvwtg0"Kp"E0" I ggtv|"
 IQ:21,!!"#\$).5#&;/5)-.\$-0\$('+5'&#:\$\\$8#+#(5#4\$#::/>:"*rr0"5652+0"Pgy"[qtm."P[<"Dcuke"
 IJ09140
- $\label{lem:condition} J \ cttkuqp."T0"*3;94+0"Wpfgtuvcpfkpi" \{qwt"qticpk| cvkqpcn"ejctcevgt0" \ 1/\&=/\&4\$M':).\#::\$E\#6 =)\#A6$

B.@\$\$!"#\$, - '&. /+\$-0\$1)2"#&\$34'(/5)-.

J ctvng { ." O 0" *4225+0" $\tilde{o}V$