$\label{eq:control_equation} $$ '()^*H+! "6!9,/4,-+(*3!0,/<>!@)-I^*B!:9)+,97!@^*0(!5/:#907>!+0/55!/$4!:)<<^*00,4!+0/I,()94,-+!(/.,!+,0!"*\)#!)$!/!-,:)-4F?-,/I^*B!3/0(!@^*0(E!))$$ 

- N2WW! < \*99\*) \$!\*\$!-,+,/-: (!UP; Q! JRSTV!, A3, \$4\*0#-,+!\*\$!5\*+:/9!7,/-!1W11!
- C,+0!,..,-!+\*AF7,/-!B-/4#/0\*)\$!-/0,+!5)-!/99!+0#4,\$0+!U\_L [ V>! J\*+3/\$\*:!UXX [ V>!C9/: IMG5-\*:/\$F G<,-\*:/\$!UXL [ V!/\$4!D,99!UXK [ V&!!
- `L[!)5!B-/4#/0,+!)?0/\*\$\*\$B!+#::,++5#9!:/-,,-!)#0:)<,+!)-!:)\$0\*\$#\*\$B!0(,\*-!,4#:/0\*)\$!
  @\*0(\*\$!+\*A!<)\$0(+!)5!,/-\$\*\$B!0(,\*-!4,B-,,!

•

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- .''*; + .'':*34+#!*
D-,+*4,\$0!)5!0(,!6\$*.,-+*07!)5!"*++)#-*!;7+0,<!
'(/$:,99)-!)5!0(,!6$*.,-+*07!)5!"*++)#-*!')9#<?*/!
OWL!g,++,!J/99!
')9#<?*/>!" f!XL100!
f 55*: ,!UL_KVdd1F1WOO^!: ()*<\#$ h #<+7+0, <\ell,4#!!
1 <= / > ? @A*
                                " /-: (!0`>!0`X2!
       C^*-0(4/0,E!!!!
        '*0*\,$+(*3E!!
                                6$*0,4!;0/0,+!
        " /-*0/9!;0/0#+E!
                                " /--*,4!@*0(!0(-,,!:(*94-,$!
       =<<*B-/0,4!5-)<!;)#0(!e)-,/!@*0(!5/<*97!*$!0`_K!
        1)3!;,:-,0!;,:#-*07!'9,/-/$:,!B-/$0,4!*$!1WOd!
< B ! 3 @ CD > ?*
        "#$\&'#(!) *+*#, -.!/&0'-\(!1&+\23&-\&,\#(!4*((&5+.\)67!P=; ]>!0\`K!
        1.8387! \text{ T}, 308!)5! \text{ "}, : (/**:/9!Z!G, -)+3/:, !R$B*\$, -*$B*!D-*$:, 0)$!6$*., -+*07*!O``1!
        98:87/T,30&!)5! ",:(/$*:/9!Z!G,-)+3/:,!R$B*$,,-*$B>!D-*$:,0)$!6$*.,-+*07>!O`d`!
        : 8 < 87!T, 30!) 5!Y, \$, -/9!R\$B*\$, -*\$B>! 6 \&!) 5!=99*\$)*+!/0! 6-?/\$/F'(/<3/*B\$>!0^d!
        = \% \cdot .! < - . \&\&(?!; 0, 3(, \$!) 7 \$B! " /0(, -!J *B(!; :()) 9 ! ' (*:/B) ! = i > !0 `dK!
        @(*A*'\$\#,B!<-.\&\&(?!T/\$*,9!C))\$,!R9,<,\$0/-7!;:())9>!'(*:/B)>!=i>!0``!
        @(*A*'$#,B!<-.&&(?!i7</$!]-#<?#99!R9,<,$0/-7!;:())9>!'(*:/B)>!=i!UO`_LFO`_XV!
        @(*A*'\$\#, B! < - . \&\&(?!i, BB, 00!R9, < ,\$0/-7!; : ()) > !GI-) > !fJ!UO`KFO`LV!
1 = E < //D > ?@A*@11 > D?C - <?C/!
Oå
        D-,+*4,\$0!) 5!0(,!6\$*.,-+*07!) 5! " *++) #-*!; 7+0, <>! " /-\&!1\WO_F3-,+,\$0!
        '(/$:,99)-!)5!0(,!6$*.,-+*07!)5!"*++)#-*F')9#<?*/>!"/-&!1W1WF3-,+,$0!
        1 (,!!"#$%&'#()*+,* - #"'+,&#*/)'(% 0 !U 6 "!;7+0, < \!*+!/!9/$4FB-/$0!*$+0*0#0*)$!0(/0!3-).*4,+!
        :, $0-/9*\, 4!/4<*$*+0-/0*)$!5)-!5)#-!#$*.,-+*0*,+>!/!(,/90(!:/-,!+7+0,<>!/$!,A0,$+*)$!3-)B-/<>!
        /$4!0,$!-,+,/-:(!/$4!0,:($)9)B7!3/-I+&!P,/-97! L>WWW!+0#4,$0+!/-,!:#--,$097!,$-)99,4!/0!*0+!
        5)#-!:/<3#+,+&!!](,!6"!;7+0,<!@/+!*0+!
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 \begin{aligned} &1X\& & i *\$:)9\$!G-:! \ b \ ,94*\$B!Q)\#\$4/0*)\$! \ " \ ,-*0!D-*\backslash ,!5)-!6\$4 \ ,-B-/4\#/0 \ ,!S \ ,+\ ,/-: (>!0`d\_! \ ,!5)-!6\$4 \ ,-B-/4\#/0 \ ,!S \ ,+\ ,/-: (>!0`d\_! \ ,!6) \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \ ,!6 \
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- 10& ; ,++\*)\$! '(/\*-!5)-!G; "R!J,/0!]-/\$+5,-!')\$5,-,\$:,!+,++\*)\$!)\$!])3\*:/9!;\*<#9/0\*)\$+>!

  T\*/B\$)+0\*:+>!/\$4!RA3,-\*<,\$0+!\*\$!Q\*-,!/\$4!')<?#+0\*)\$!;7+0,<+>!g#97>!1WW\_>!c/\$:)#.,->!
  '/\$/4/!
- 11k ",:(/\$\*:/9!R\$B\*\$,,-\*\$B!T,3/-0<,\$0!J,/4!RA,:#0\*.,!')<<\*00,,!",<?,->!1\text{WWXFD-},+,\$0!
- 1K&\(\delta\), \(\delta\). \(\
- 12& ; ,++\*)\$! ' (/\*-!5)-!nT-)39,0! ' ) < ?#+0\*)\$0!4#-\*\$B!0(,!2!"!g)\*\$0! " ,,0\*\$B!)5!0(,!6&;&!;,:0\*)\$+! 
  )5!0(,!') < ?#+0\*)\$!=\$+0\*0#0,>! " /-:(>!1\text{WWL}:D(\*9/4,93(\*/>!DG!))\$
- 1X& P/0\*)\$/9!G:/4, <7!)5!R\$B\*\$, ,-\*\$B! b )-I+()3!D/-0\*:\*3/\$0!5)-! eFOX!R4#:/0\*)\$/9!S,5)-<+>! b /+(\*\$B0)\$>!T '>!Q,?-#/-7>!1WWL!

1\_&

22&

- $Q-/:0/9!\ Y\ ,\ )<,0-7!\ )5!\ i\ ^*B\ (0FT\#07!\ T^*\ ,+\ ,9!\ R\$B^*\$\ ,\ !D/-0^*:\#9/0\ ,+o>!\ ;GR!\ D/3\ ,-!\ 1WWKFWOFKOX^*!\ U1WWKV\&!$
- KO& g&! r (#>! G&! =--,-/>! "&%&! '()\*>! Y& b&! "#9()99/\$4>! i&! Y-\*0\)>! /\$4! g&! ;#)FG\$00\*9/>! n ",/+#-,<,\$0!)5! i\*B(0!RA0\*\$:0\*)\$! ')\$+0/\$0!5)-!gDFd!;))0!\$!0(,!c\*+\*?9,!/\$4!P,/-F=\$5-/-,4!;3,:0-#<0>!

- \_X\( \text{"\langle \lambda ! ' ()\*\lambda ! Q; ) } 0\( \text{\$\text{9\text{!} S / 4\text{\0}\text{)} \$!R55, : 0\text{!\text{!} S 1 1 1 2 \text{\0}\
- \_\_& ;&i&! " /\$\,99)>!e&f&!i,,!/\$4! " &%&! '()\*>!q;))0\*\$B!\*\$! " \*:-)B-/.\*07!T-)39,0! ') < ?#+0\*)\$q>! ],:(\$\*:/9! ",,0\*\$B!)5!0(,! ',\$0-/9!;0/0,+!;,:0\*)\$!)5!0(,! ') < ?#+0\*)\$!=\$+0\*0#0,>!33&OKWFOKL! UO``\_V&!
- \_d& e &G&!g,\$+,\$!/\$4! " &%&! ' ()\*>!q ' /9\*?-/0\*)\$!/\$4! ' )--,:0\*)\$!)5! i ==!5)-!;))0! c )9#<,!Q-/:0\*)\$! 
  " ,/+#-,<,\$0+q>! ] ,: (\$\*:/9! " ,,0\*\$B! )5! 0(,! ',\$0-/9! ;0/0,+! ;,:0\*)\$! )5! 0(,! ') <?#+0\*)\$! 
  =\$+0\*0#0,>!33&KWKFKWd!UO``\_V&!
- \_`& Y&"&! "#9()99/\$4>! P&! C-7\$,->! "&! Q,-\$/\$4,\!/\$4! "&%&! '()\*>!n](,!C/+\*+!5)-!/!;<)I,!
  ')\$:,\$0-/0\*)\$! ",/+#-,<,\$0! #+\*\$B! i\*B(0! RA0\*\$:0\*)\$o>! =\$0,-\$/0\*)\$/9! ')\$5,-,\$:,!)5!0(,!
  :):\*,07!)5!0\*-,!D-)0,:0\*)\$!R\$B\*\$,,-+!UO`` V&!

- $\begin{array}{l} f-4,-!*\$!\,i\ /<^*\$/-!T^*55\#+^*)\$!Q9/<,+!/\$4!/!\,i\ /-B,F\,;\,:/9,!gDFd!D)\,)9!Q^*-,o\&!!\,;\,3-^*\$B!\ ''\ ,\,,0^*\$B!)5!\\ 0(\,,!\ b\ ,+0,-\$!\ ;\,,0/0,+!\ ;\,,:0^*)\$!\,)5!\,0(\,,!\ '\ )<?\#+0^*)\$!=\$+0^*0\#0,>!\ 6\$^*.\,,-+^*07!\,)5!\ '\ /9^*5)-\$^*/>!\ ;\,/\$!\ T^*,B)>!U1WW1V! \end{array}$
- `K& g&! ;#)FG\$00\*9/>! i&! Y-\*0\)>! D&! T-)\4/>! /\$4! "&%&! '()\*>!  $n'(/-/:0,-*\/0*)$ \$! )5! ;))0! " )-3()9)B7>! ')<3)+\*0\*)\$>!/\$4! f 30\*:/9!D-)3,-0\*,+!5-)<! i /-B,!D))9!Q\*-,+o>!G; " R!D/3,-! = " R'R!IWW1FKK`\_1!U1WW1V&!

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OWd&
                                     J&!C#-$+*4,>!g&!Q,--)$*>!T&!C)$$,99>!%&!Y)B)0+*>! "&%&! '()*>!G&]&!g)($+)$>!g&!;3/$*,->!
                                   nS_{+,-}: (!RA3_{-,+,+}: 5)-!]_{+,-}: (-+! *\$!P/\$)0_{+,-}: (\$)9)B70>!G'_{+,-}: G\$\#/9! "_{+,0}*\$B>!
                                   D(*9/4.93(*/>!DG>!U1WWdV&!!
                                    \frac{1}{2} \frac{1}
OW`&
                                    T^*, +, 9!/\$4!C^*)4^*, +, 9!;))00>!2!"!=\$0H9!')\$5, -, \$:, !)\$!'))9^*\$B!/\$4!J, /0^*\$B!], :(\$)9)B^*, +>!
                                   g*$(/,>!e)-,/!U1WWdV&!
                                   \frac{1}{2} \int \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \left[ \frac{1}{2} \right] - \frac{1}{2} \left[ \frac{1}{2} \left
OOW&
                                   T-)39,0!Q9/<,+o>!1WW`!=G'!"*:-)B-/.*07!;:*,$:,!;7<3)+*#<>!T/,u,)$>!;)#0(!e)-,/>!
                                   U1WW\V&!
                                     J \& \& ! : \#(>! " \& ! \% \& ! ' () *! / $4! D \& c \& ! O, -I \# >! n P, @ ! f ? +, - . / 0 *) $+! > 5! : ) > 0 * $B! C, (/.*) -! > 5! = +) 9/0, 4!
000k
                                    T-39,0+! 5! FJ,30/\$,!*\$!"*:-)B-/.*07!")\$4*0*)\$+o>! 1WOO!"!"! 6;! P/0*)\$/9!") < ?#+0*)\$!
                                              ,,0*$B>!G09/$0/>!YG!U1WOOV&!
 140B0*/(.2%"('*P/%&$%2*5"*345#&0!
Oh! e7,)$BFf)I!i,,E!! ! "; "R!\`K!6='>!"; "R!\dd!=$J/!e)-,/>!C; "R!\dX!=$J/!e)-,/!!
                 D(\&T\&!](,+*+!])3*:E!!!
                                                                                                                                            q](,!R55,:0+!)5!;))0*$B!*$!T-)39,0!')<?#+0*)$!6$4,-!
                                                                                                                                               "*:-)B-/.*07!/$4!P)-</9FY-/.*07!')$4*0*)$+q!
                 Y-/4\#/0*)$!T/0.E!!
                                                                                                                                           LM`!
                    '#--,$0!D)+*0*)$E!!
                                                                                                                                           Q)-<,-!",<?,-!)5!0(,!S,+,/-:(!;0/55>!G-B)$$,!P/0*)$/9!
                                                                                                                                              i/?)-/0)-7!
                                                                                                                                           C; "R!k^2!6\$*..+*07!)5!T,9/@/-.k!
 1\&! e^*-I!G\&!g, \$+, \$E! !
                  D(\&T\&!](,+*+!])3*:E!!
                                                                                                                                            qf30^*:/9!T^*/B$)+0^*:!T,...,9)3<,$0!5)-!#+,!*$!T-)39,0!')<?#+0^*)$ql!
                  Y-/4\#/0*)$!T/0,E!!
                                                                                                                                            LMWW!
                    '#--,$0!D)+*0*)$E!!!
                                                                                                                                            ;)50@/-,!R$B*$,,-!/0!],A0-)$!;7+0,<+!
K\&! ; /<\#, 9! i \&! "/\$ \setminus, 99) E! !
                                                                                                                                           C: "R!k`X!6='!
                  D(\&T\&!](,+*+!])3*:E!!
                                                                                                                                            q " )4,9*$B!)5!;))0*$B!/$4!S/4*/0*)$!R55,:0+!*$! " *:-)B-/.*07!
                                                                                                                                             T-)39,0!')<?#+0*)$q!
                                                                                                                                           O1MWW!!
                 Y-/4\#/0*)$!T/0,E!!!!
                 D)+*0*)$E! ! ! ! ", <?,-!)5!0(,!S,+,/-:(!;0/55>!C#*94*$B!/$4!Q*-,!S,+,/-:(>!P=;]!!
2&! g*$7#!r (#E
```

Y-/4#/0\*)\$!T/0,E!!! dMWO!

Χå

E!?B<B\*1=>J<3C/\*

B5(%\* =+7%\* @:%''6)\*

C#(7%\*+,\*1&+R%6(\*

@ 0+."(\* E."2#":\*

E."2%2\* 1%&#+2\*

OWMWW!	D=!	PG;G!	i /-B,!T-)39,0!RA3,-*<,\$0+!/0!0(,!gG " = '! T-)3+(/50!Q/:*9*0*,+!	NKW>WWW!	1WWWF1WW1!
`MWO!	')FD=!	P;Q>!C,\$! Q-/\$I9*\$! ],:(!D/-0\$,-!	6 c!/\$4!P,/-FQ*,94!S/ \$! " *:-)+:)37!</td <td>N2WW&gt;WWW!</td> <td>1WWOF1WW2!</td>	N2WW>WWW!	1WWOF1WW2!
OUTTIAL	LIEDI	D 01	TTD C 3 TUD (A)	ATT TOWNS T 111574	4 1111114 114 114111 4

OMW1! ')FD=! P;Q! =YRS]E!!P/\$)+:/9,!R\$B\*\$,,-\*\$B!/\$4! NK>KWW>LWX! 1WW1F1WW\_!
! :\*,\$:,!

XMWL!	' )FD=!	P;Q!	YeFO1E!R\$B*\$,,-*\$B!/+!/!')\$0,A0#/9!	NO>d2d>WWW!	1WWXF1WW`!
			c,(*:9,!5)-!;:*,\$:,!/\$4!"/0(, 0*:+!</td <td></td> <td></td>		
			R4#:/0*)\$!		

OOMWL! D=!

T,30&!)5! R4#:/0\*)\$ XWW`! ')