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! "#\$"%&'(')*+*, -\$%

! "#\$%&'()* (+), -.) / 012)

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P

\ (0. 143!14!0. 1!) * = 01 (4!). / <<' & * = % @ * ! 0. * !
& * = (7 7 * 4 @ / 01 (4! 6 (&! 0. * !' /)) / 3 * ! (6! 4 * E!
</E) #
!

f ^ (&! Y * ' [@ ! 5 D [Y ! / 4 @ ! G [: Y J ! 0 (! @ * B * < (' !
/ 4 @ ! ' & (7 (0 * ! 3 * 4 @ * & C) * 4) 1 0 1 B * !
= % & & 1 = % < % 7 ' ! 1 4) 0 & % = 0 1 (4 / < 7 / 0 * & 1 / <) !
= / ' / = 1 0 > ! A % 1 @ 1 4 3 ! 6 (& ! 6 / = % 0 > ! / 4 @ !
' * &) (4 4 * < ! a Q # J # ! R I W V ! : * = # 9 , ! P @ T b !
f [4 & (<< 7 * 4 0 ! (6 ! E (7 * 4 ! 1 4 ! 4 (4 C

f [4./4=*7*40! (6! ' &(3&/77143!
 '&(@%=01(4! /4@! 17/3*! 7/_143! 0./0!
 '&*)*40! E(7*4m)! 4**@)! 1))%*)! /4@!
 =(4=*&4Z!
 f J<<(/01(4!(6!)' /=*!/1&017*!/4@!&*) (%&=*)!
 6(&! 0.*! /1&143! (6! /@B*&01)*7*40)! 0./0!
 '&(7(0*!E(7*4m)! .%7/4!&13. 0)Z!
 f [4)%&143!0./0!14!/<<)=. ((<!(6!e(%&4/<!)7'
 146(&7/01(4! /4@! =(77%41=/01(4! /4@!
 4/01(4/< 7*@! /! 6*@*&/01(4! /4@!
 /))=(1/01(4! 0.*! 3*4@*&! *d%/<10>! /&*!
 140*3&/0*@! 14! 0.*! .%7/4! &*) (%&=*)!
 @*B*<(' 7*40Z!
 f : *6C&*3%/0(&>! 6(&! 7*@! /! 0*<*B1)1(4!
 =/A<*! 6!<7! /4@! /@B*&01)143!). /<< /<)(!
 4)%&=!(7' <1/4=*!E10. !0.*!J=0Z!
 f 5&*/01(4!(6!N(=/<2*!@1/K(/&@!14!/<<N] C)!
 0(! 7(410(&! 0.*!17' <*7*40/01(4!). /<<A*!
 4=(%&/3@! 0(! 7(410(&! 0.*!
 17' <*7*40/01(4#!
 !

!R#

f J==*)! 0(! 5(7' &*. *4)1B*! D*/<0. !
 \$&(3&/7Z!
 f 2/0*&4/< =/&*! P' &*4/0/<! @*<B*&>! /4@!
 ')0C4/0/<!1146/40!. */<0. !/4@!4%0&101(4!Z!
 f \$&(7(01(4! (6! K&*/)06**@143! /4@! \$&(' *&!
 \%0&101(4!6(&!</=0/0143! 7(0.*&)Z!

f G. *!Y: - Y!YUD! /4@!\$U\$5U2!). /<!) *0!
)0/4@/&@)! /4@! @*B* <('! 3*4@*&C6/1&!
7 (@%*)! (4! 7/&&1/3*! 6/7!>! &* </01(4)!
/4@!6/7!>! *66* =0!B* 4*)#

f N] c)!). /<]!

k \$&(B!@*!0&/14143)!/4@!) * 714/&!) (4!0. *!
' (' %</&H/01(4! (6! &13. 0)! /4@!
(A<13/01(4)! (6!)' (%*)!0(E/&@)! */=. !
(0. *&! 0(! &*@%=*! /4@! ' &*B*40! 0. *!
)0*&*(0>' 143! (6! &(<*)! 7%<0! <*!
A%&@* 4!/4@!)%A(&@14/01(4!(6!E (7*4Z!

k \$&*C7/&&1/3*!=(%4)*<143!' &(3&/7)Z!

k J@B(=/=>! (4! 0. *! 7 (&/< (A<13/01(4!
/4@! &*)' (4)1A1<0>! 14! /)%)&143! 0. *!
&13. 0)! /4@! E* <<CA*143! (6! 0. *1&!
=. 1<@&*4! 14=<@143! 4%7A*&! /4@!
)' /=143!(6! =. 1<@&*4Z!

k "4=<@*!14!0. *!0&/14143)!/4@!) * 714/&!)
14! A/&/43/>)! 0. *! ^/7!>! 5(@*#!
!

T Ma a Ca a Ma a
S

"0! &*6*&!) 0(! 0. *! @1)/@B/40/3*@! (&! B%<4*&/A<*!
' *&)(4)! (&! 3&('%')! E. (! /&*! 7 ()0>! <B143! 14!
' (B*&0>! /4@! . /B*!<100<*! (&! 4 (!/=*)!0(!</4@! /4@!
(0. *&! &*) (%&=*!) /)! E* << /)! A/)1=!) (=1/< /4@!
*=(4 (71=!) *&B1=*!)% =. !/)! . */<. !=/&*! *@% =/01(4!
E/0*&! /4@!)/410/01(4!* 7' <(> 7*40! /4@!<B* <. (@!
(' ' (&0%4101*)! . (%)143'!) (=1/<) * =%&10>! ' . >)1 =/<
146&/)0&%=0%&*! /4@!0. *!e%)01=*!)>)0* 7#aQ#J#R! WV!
: * =#!FP@Tb!
!

2/&314/<H* @!3&('%')!14=<@*!A%0!4 (0!<710* @!0(j!

f)7/<<6/&7*&!) /4@!&%&/<E (&_*&)Z!

Q13. 0)!0(!0. *! 5!B1< : *&B1=*! 5 (7 71))1(4! /4@!0. *!
Y*' /&07*40! (6! 0. *! "40*&1(&! /4@! N(=/<!
] (B*&4 7 *40#!
!

G. *! B1(<*4=*!). /<! A*! =(4)1@*&*@! /33&/B/0143!
(66*4)*! E10. ! =(6&*)' (4@143! ' *4/<0!*)! E. 1=. !
E(%@!@*' *4@!(4!0. *!)*B*&10>!(6!0. *!(66*4)*#!
!

!!
G. *!' *&) (4!@1&* =0<>!&*)' (4)1A<*!6(&!0. *!B1(</01(4!
) . /<!A*!</A<*!0(!' />!@/7/3*)#
!

p[: #! G. *! (66*4@*!@! ' /&0>! 7/>! /B/1< (6! (0. *&!
&*7*!@*)!%4@*!&10. *!</E!/4@! =/4!14B(_ *!/4>!(6!0. *!
(0. *&!& (B1)1(4)!(6!*L1)0143!</E)!*)' * =1/<>!0. ()*!
0. /0!' &(0* =0!0. *!&13. 0)!(6!E (7*4#

! "#\$%&' (' &) *(+, -() , . /0(
!
V a a W a C
R A N

"0!1)!/4>!/ =0!(6!3*4@*&CA/) *@!B1(<*4=*!0. /0!&*)%<0!
(&! 1)! <_ *>! 0(! &*)%<0! 14! ' . >)1 =/<!) *L%/< (&
')>= . (<(31 =/< . /&7! (&!)%66*&143! 0(! E (7*4!
14 =%@143! 0. &*/0)! (&!)% =. ! / =0)! = (*& =1(4! (&
/&A10&/&>!@*' &1B/01(4!(6!<A*&0>!E. *0. *&! (= %&&143!
14!' %A< =! (&! &1B/0*!<16*#!] *4@*&CA/) *@!B1(<*4=*!1)!
/4>!B1(<*4=*!146< =0*!@!(4!E (7*4!A* =/%) *!(6!0. *!&!
) *L#!
!

W# 5(/%)143!\$. >)1 =/<D/&7!0(!0. *!E (7/4! (&
. *&! =. 1<@Z!

, # G. &*/0*4143!0(! =/%) *!0. *!E (7/4! (&! . *&!
= . 1<@!' . >)1 =/< . /&7Z!
9# J00*7' 0143!0(! =/%) *!0. *!E (7/4! (&! . *&!
= . 1<@!' . >)1 =/< . /&7Z!
F# \$</ =143!0. *!E (7/4! (&! . *&! =. 1<@!14!6* /&! (6!
17 714*40!' . >)1 =/< . /&7Z!
X# 5(7' *<143! 0. *!E (7/4! (&! . *&! =. 1<@! 0(!
43/3!14!/4!/ =0!E. *&*14!0. *!E (7/4! (&
. *&! =. 1<@!' /)!0. *!&13. 0!0!(Ae* =0Z!
S# "46< =0143! (&!0. &*/0*4143!0(!146< =0!' . >)1 =/<
. /&7! (4! (4*) *<6 (&! 0. *! ' %&') *! (6!
= (40& (<143! . *&! / =01(4) (&!@* =1)1(4)Z!
I# 5(/%)143! (&! /00*7' 0143! 0(! =/%) *! 0. *!
E (7/4! (&! . *&! =. 1<@! 0(! *43/3*! 14! /4>!
) *L%/</ =0!B10>!E. 1 =. !@ (*!)!4 (0! = (4)0!0%0*!
&/' *!A>16 (& =*! (&!0. &*/0! (6!6 (& =*!' . >)1 =/<
. /&7'! (&! 0. & (%3. ! 140171@/01(4! @1&* =0*!@!

F# \$&*B*40143!0. *!E(7/4!14!*43/3143!14!/4>!<*31017/0*! '&(6*))1(4! (==%/01(4! A%)14*)! (&! /=01B10>! (&! =(40&<<143! 0. *! B1=017m)! (E4! 7(4*>! (&! '&(' *&01*)! (&!)(<*>! =(40&<<143! 0. *! =(4e%3/<! (&! =(77(4!7(4*>!(&! '&(' *&01*)#!
!

W# :0/<_143! (&!6<<(E143!0. *!E(7/4! (&! . *&! =. 1<@!14!' %A<=!(&! ' &1B/0*!' </=**)Z!
, # \$**&143! 14! 0. *! E14@(E! (&! <143*&143! (%0)1@*!0. *!&*)1@*4=*! (6!0. *!E(7/4! (&! . *&! =. 1<@Z!
9# [40*&143! (&!&*7/14143!14!0. *!@E* <<143! (&! (4!0. *!' &(' *&0>!(6!0. *!E(7/4!(&! . *&! =. 1<@! /3/14)0!. *&g. 1)!E1<<Z

W# G. *)*L%/46/B(&!1)!7/@*!/)!/!=(4@101(4!
6(&!)(7*!6/B(&!4_*!.1&143!(&!=(4014%*
*7' <(>7*40!(&!&(&7(01(4Z!
, # 0./0!0.*!&*6%)/40(!3&/40!0.*!)*L%/46/B(&
E1<& &*)%0!14!@1)=&1714/01(4!@*41/4(&
&*@%=01(4!(6!*7' <(>7*40!(' ' (&0%4101*)!
/4@!0.*!17' /1&7*40!(6!0.*!*7' <(>**)!
&13.0)!(&!&1B1<*3*)Z!(&!!
9# 0./0!0.*!@*7/4@!6(&!)*L%/46/B(&!&*)%0!
14!/4!140171@/0143! .)0!<*! (&! (66*4)1B*!
*4B1&(47*40!6(&!0.*!*7' <(>**)# aQ#J#
I O I I !: *=#9b!!

\U#"4!0.*!/=)*!(6! '!0.*!/=0!(6!
. (<@143! /4@!)d%**H143! 0.*! B1=017;)!). (%<*&)!
&%44143!.1)!6143*&!/=&())!. *&4*=_! /4@!0!=_<143!. *&
/&!./B143!14/' ' &(' &1/0!=(4B*&)/01(4)!E10.!. *&!
31B143!. *&!7(4*>!/<<*3*@>!6(&.*&!*L' *4*)!E10.!
0.*!' &(71)*!(6!6%0%&*!' &1B1<*3*)! /<< (6! E. 1=.!
=<*/&>!=(4)010%0*! /4! %4)' (_*4! &*d%*)0! 6(&! /!
)*L%/46/B(&#G. *&*6(&*!10!4**@!4(0!A*!@1&*=0!A%0!
=/4!A*!17' <1*@!6&(7!0.*!/=0)!(6!0.*! (66*4@*&#
aY(7143(!B)#Q/>/</!#] #Q#\ (#!WXXO9W!^*A&/&>!
WO!, VVOb!
!

A Ra La
Ma aCa aD Ra
P a Ma a a

Y/0*!&/' *!@&%3!1)!/!@&%3!E. 1=. !6/=140/0*)!&/' *!A>!
=/%)143! 0*7' (&/&>! 14. 1A101(4! (&! 7*7 (&>! <())#
J<=(. (<1)! (60*4!%) *@!6(&!0. 1)#!Y&%3)!(&!/<=(. (<=/4!
7/_*!/!' *&)(4!=(46%)*!E10. !E. /0!1)! . /' ' *4143!
<*)!)/A<*!0(!@*6*4@!0. *7)*-B*)!/3/14)0!%4E/40*@!
) *L%/<=(40/=0! (&! %4/A<*! 0(! &*7*7A*&! E. /0!
. /' ' *4*@#!aC: !U661=*! (4!- (7*4m)!D*/<0. !Y/0*!
Q/' *!Y&%3)!P, VWRTb!

!

G. *!:%' &*7*!5(%&0!. /@!/!=. /4=*!0(!&%<*!(4!@/0*!
&/' *!@&%3!E10. !&/' *!=/)*)#G. 1)!5(%&0!614@)!0. /0!
5/3! @!@! . /B*!) *L%/< 140*&=(%&)*! E10. ! rJJJr!
E. *4!). *!E/)!/><*' !/4@!)0!<4@*!&!0. *!146%*4=*!
(6!/<=(. (<#G. *!=/) *!0. %)16/<<!)%4@*!&!0. *!) *=(4@!
' /&/3&/' . ! (6!&/' *j!rE. *4!0. *! (66*4@*@!' /&0>!1)!
@*' &1B*@(6!&*/)(4!(&!1)! (0. *E1) *!%4=(4)=1(%)#r!
"0!1)!/<0(3*0. *!&177/0*&1/<0. /0!0. *!' &()) *=%01(4m)!
*B1@*4=*! 6/1<*@! 0(! *)0/A<). ! 0. *!' &*) *4=*! (6!
' . >)1=/<6(&=*!0. &*/0! (&!140171@/01(4!A*=%) *!/)!

0. *!ne(140!@*=1)1(4!(4!0. *!4%7A*!&!/4@!)' /=143! (6!
0. *!&! =. 1<@&*4 a"7A(43!B)#! U=. (/! h&#!] #Q#! \ (#!
, VFOWR!J' &!&O!', VWFb!
!

\U#! G. *! B(<%40/&>! 14017/=>! A*0E**4! 0E(! P, T!
%47/&&1*!@!/@%&0)! E. *!&*!A(0. !/&*!4(0!%4@*!&!/4>!
17' *@17*40!0(!7/&&>!E. *!&*!4(!@*=*10!*L1)0)!/4@!
E. 1=. !E/)!@ (4*!14!=(7' <*0*'! &1B/=>!1)! 4*10. *!&!
=&1714/4 4(&!)(! %4' &14=1' <*@! /)! 0(! E/&&/40!
@1)=1' &14/&>! />=01(4#! a"4(=*40*! B)#! :0#! ?14=*40!
^(%4@/01(4!6(&!5. 1<@&*4!/4@!J3143!"4=#!] #Q#! \ (#!
, V, S, W!h%4*!, , !, VWSb!
!

D

"4!, VVR!5(43&*)!*4/=0*!@!Q*' %A4=J=0\ (#RI WV!
(&!0. *! 2/34/!5/&0/!6(&! - (7*4!E. 1=. !' &(B1@*)!
0. /0!0. *! : 0/0*!n). /<40/_*!<4/' ' &(' &1/0*!7*/)%&*)!
0(! *&1714/0*!@1)=&1714/01(4!/3/14)0! E(7*4!14!/<4
7/00*!&!&*</0143!0(!7/&&1/3*!/4@!6/71<!&*</01(4)#0!
G. 1)!4*=(*)/&1<14=%@*)!0. *!) *=(4@!' /&/3&/' . !(6!
J&0!<*! , S! (6!0. *! ^/71<!5(@*#! G. %) ! J&0!<*! , S!
) . (%@!A*!140*!&' &*0*!@!0(17*/4!0. /0!10!1)!&&*<*B/40!
6(&!(=%&0)!0(!@*0*&714*!16!10!1)!0. *!6(&*134!)' (%) *!
0. /0!' &(=%&*)!0. *!@1B(&=*!/A&(/@#!U4=*!/!@1B(&=*!
@*=&*!1)!1))%*!@!0. *! @1B(&=*!A*=(7*!) nB/&4@>!
(A0/14*!@0!/4@!='/ /=10/0*)!0. *!6(&*134!)' (%) *!0(!
7/&&>#! G. *!)/7*!)0/0%)! . (%@!A*!3!B*4!0(!0. *!
^14' 14(!)' (%) *#! aQ/= . (! B)#! G/4/_/'] #Q#! \ (#!
WRRXWX!h%4*!, X!, VWOb!
!

p[: #! 4!0. *! =/) *!(6!Q*' %A4=J)#! 2/4/<(!/!^14' 14(!
=10!H*4!E/)! 7/&&1*!@!0(!/!h/' /4*) *!\ /01(4/4#! G. *!
=(%' <*!6!<*!@!6(&!@1B(&=*!14!h/' /4!/4@!0. *!^14' 14(!
' *0101(4*!@! 0(! . /B*! 0. *!&! 7/&&1/3*! /=4=*<*!@#! "4!
&*7/4@143!0. *! =/) *!0(!0. *!0&1/&4=(%&0!0. *!5(%&0!
4(0*!@!0. /0!0. *!A%&&*4!E/)! (4!0. *!^14' 14(!0(! &(B*!

0. /0!0. *!@1B(&=*!E/)!B/&4/0*!@!A>h/' /4*) *!</E/)!
E*!<4/)! . *!&!6(&7*!&! . %)A/4@)! =/' /=10>!0(!<*3/<@!
&*7/&&>#!aQ*' %A4=J)#! 2/4/<(!/! #Q#! \ (#!, , W, VR!
J' &!&!, F!, VWOb!
!

p[: #!
!
- . *!&*!0. *! . %)A/4@!/==%*)! . 1)!
E16*!14!=(%&0! (6! /@%&0*!&>! /!@*=&*! (6! ' *!&' *0*/&
@1B(&=*! 7/>! A*!3&/40*!@! A>0. *!=(%&0! /60*!&!@*!
. *!/&143/4@!/60*!&!0. *! /&01*!)! . /<4. /B*! *!&6(&7*!
0. *! ' &*)=&1A*!@!/=0)! (6!17' &*=/01(4!P1;/4T#!
!

CG. *! E16*! 7/>! /60*!&! . /B143!
(66*!&*!@!0(!&*0%&4!(&!&*4(4=!*! . *!&!@ (E *!&!(&10(!' />!
/4>! (0. *!&! </E6%&4=(4)1@*!&/01(4! 6(&! . *!&! &*!<*/)! *!
P_ . %<1!6&(7!0. *!7/&&1/3*!A(4@!' *0101(4!0. *!=(%&0!
6(&!@1B(&=*#!G. *!=(%&0!) . /<4!14!7*!&10(&1(%!)!/=) *!)!
/4@! /60*!&! 6!L143! 0. *! =(4)1@*!&/01(4! 1))%*! 0. *!
=(&&*)' (4@143!@*=&*!#!
!
!"6!0. *! . %)A/4@! . /)!@*!<*3/0*!@!
P0/6E1@!0!0!0. *!E16*!0. *!&13. 0!0(! *66*=0! /!0/<d! /0!
0. *!017*! (6!0. *! =*!<*A&/01(4! (6!0. *! 7/&&1/3*! (&
0. *!&*! /60*!&! . *! 7/>! &*! %@! /0*!0. *! 7/&&1/3*! /4@!
0. *!&*! %@! /01(4! E(%@! . /B*!0. *!) /7*! *66*=0! /)!16!
10!E *!&*! &(4(%4=*!@!A>0. *! . %)A/4@! . 17) *!&#!
!
^(&! 2%)&17! E(7*4! J&0!<*!X, !=. /' 0*!&!0. &*! (6!
0. *! : . /&1!</E!' &(B1@*)!6(&!@1B(&=*!A>16/)_ . #!G. *!

*# "4)/410>!(&!/66<1=01(4!(6!0. *!. %)A/4@!E10. !

O# \$/&* 40! [66*=01B*4*)! : *&B1=*!) E. *&*!
)143<*! ' /&*40)! /&*! 0/%3. 0! /A(%0! */&<!
=. 1@. ((@! @*B*<(' 7*40! . */<. ! =/&*!
A* . /B1(&! 7/4/3*7*40! /4@! &13. 0)! /4@!
@%01*)!(6! /&*40)!/4@!=. 1@&*4#!
R# 5(%4)*<43! : *&B1=*!)6(&! 14@1B1@%/<! ' **&!

P a

J&01=<*! W9X! (6! 0. *! N/A(&! 5 (@*! /4@! &*=*40!
e%&1)' &%@*4=*!@*=</&*)!0. /0! /4! *7' <(>***!/=44 (0!
A*!@1) 71)) *@!(4! /==(%40! (6! . *&! ' &*34/4=>! /4@!10)!
&*</0* @! /1<7*40)#!

!
"4! 0. *! =/) *! (6! Y*Δ 2 (40*! \$. 1Δ! ' 14*)! "4=#! B)#!
?*</)=(!0. *!5(%&0!=(4=%&!)!E10. !0. *!5J!Δ_*E1)*!
&%Δ43!0. /0!&*)' (4@*40;)!1=_4*)!E/)!' &*34/4=>C
&*</0* @! /4@! . *4=*! 0. *! ' *0101(4* &! =/44 (0!
0* &714/0*! &*)' (4@*40;)!) * &B1=*)#! aY*Δ 2 (40*!
\$. 1Δ! ' 14*)! "4=#! B)#! ?*</)=(!] #Q#! \ (#! WX9F! I ! !
2/ &=. !S! , VVI b!
!

\U#JA) *4=*! (4! /==(%40! (6! =. 1@A1&0. !=/4! . /&@>!
A*!=(4)1@* &* @! /!6 (&A1@*4! /!=0! (&! /!@* &* Δ=01 (4! (6!
@%0>! 7% =. !<*)!)@ (*!)!10!17' >!E &(436%Δ140*40! (4!
0. *! ' /&0! (6!0. *! *7' <(>***#aN/_ ' %*!Y&%3!"4=#! B)#!
K*Δ3/!] #Q#! \ (#! WSS9! R!U=0(A* &! , V! , VVXb!
!

G. *! (66*4@* &! E (%@!A*!)%Ae* =0! 0(!0. *! ' *4/Δ1*)!
' &(B1@* @!%4@* &!J&01=<*! , OO!(6!0. *!N/A (&15 (@*!0. *!
3*4* &/Δ! *4/Δ>! =</%) *!%4@* &! /1@! = (@*#!^14* j! \ (0!
<*)! 0. /4! \$WVVV! 4 (&! 7 (&*! 0. /4! \$WV VVVZ! (&!
"7' &1) (47*40j! 4 (0!<*)!)!0. /4! 9! 7 (40.)! (&! 7 (&*!
0. /4! 9! >* /&)! (&! A(0. ! /0!0. *! @1) = &*01 (4! (6! 0. *!
=(%&0#!

S a L a W

p[: #! ^ (&!0E (!P, T! 7 (40.)!E10. !6%<<' />!6&(7! . * &!
7' <(> &! A/) *@! (4! . * &! 3&())! 7 (40. >!
=(7' *4)/01(4! 6 (<<(E143!)%&3* &>! =/%) *@! A>!
3>4* = (<(31=/Δ @1) (&@* &!)! ' &(B1@* @! 0. /0!). *! . /)!
&*4@* &* @! = (4014% (%)! /33&*3/0*! *7' <(>7*40!
) * &B1=*! (6! /0! <*/0!)!1L!PST! 7 (40.)!6 (&!0. *! </)0!W, !

7 (40.)#! G. 1)!0E (C7 (40. !<*/B*!1)!14! /@101(4! 0(!
<*/B*! ' &B1<*3*)!%4@* &!L1)0143k/E)#aY#U#WWW, CWW!
: * =#WP/Tb!

Y1) (&@* &!)0. /0!E (%@!&*d%1&*!)%&31=/Δ! &(=*%&*!)
(6!6*7 /<*!&* ' & (@%=01B*! (&3/4)!)% =. !/)!0. *!B/314/!
=* &B1! %0* &%)! 6/ <<(' 1/4! 0% A*)! (B/ &1*)! A&* /0!
/ @4* L! /4@! * &B1=16< (&#!0!14=Δ% @*)! . >)0* &* =0 (7 >!
(B/ &1* =0 (7 >! /4@! 7/)0* =0 (7 >#aY#U#WWW, CWW! : * =#
W!PATb!
!

W# : . *! . /)! &*4@* &* @!S!7 (40.)!(6! = (4014% (%)!
/33&*3/0*! *7' <(>7*40!) * &B1=*!E10. 14!W, !
7 (40.)! ' &1 (&!0 (!0. *!)%&3* &>!
, # : . *! . /)! 6!<* @! /4! /' ' Δ=01(4! 6 (&!) ' * =1/Δ
<*/B*!14! /== (&/4=*!E10. !: * =01(4!9!
9# : . *! . /)! %4@* &3(4*!)%&3* &>! @%*! 0(!
3>4* = (<(31=/Δ @1) (&@* &!) /)! = * &0161* @! A>! /!
= (7' *0*40! ' . >)1=1/4# aY#U#WWW, CWW! : * =#
, b!
!

W# - 10. 14! /! &* /) (4/A<*! 0!7*! A*6 (&*! 0. *!
)%&3* &>!
, # - 10. 14! /! 0!7*! ' * &1 (@! ' &(B1@* @! A>!
= (7' /4>! &*3% </01(4)! /4@! A>! 0. *!
5 (<<=01B*! K/ &3/14143! J3&* *7*40 aY#U#!
WW, CWW! : * =#9b!
!

f

k \$&1 (&! /' ' Δ=01(4!6 (&k*/B*!) . /<<4 (0!A*!
4* =*) /&>! 14! =/) *!)! &*d%1&143!
7 &3*4=>!)%&31=/Δ! ' &(=*%&*!
' &(B1@* @!
■ [7' <(>* &!) . /<< A*! 146 (&7* @!
B* &A/ <<!) (&! 14! E &100*4! 6 (&7!
E10. 14! /! &* /) (4/A<*! ' * &1 (@! (6!
0!7*
■ ^%&0. * &! /60* &!)%&3* &>! 0. *!
*7' <(>***! /60* &! 0. *!)%&3* &>! (&!

0. *!&*=%' *&/0143!' *&1(@!). /<<61<*&
. *&!/ ' ' <1=/01(4#

Ma L a E a

G(!d%/<6>6(&!0. *!3&/40!(6!7/0*&410>k*/B*!A*4*610!
0. *! 6*7/<*&! E(&_*&! 7%)0! 7**0! 0. *! 6(<<(E143!
&*d%1&*7*40)j!

/# :. *!7%)0!. /B*!/0!<*/)0!0. &**!P9T!7(40. <!
=(40&1A%01(4)!14!0. *!0E* <B*C7(40. !' *&1(@!
177* @1/0*& <!' &*=@143!0. *!) *7*)0*&! (6!
=. 1@A1&0. ! 71)=/ &&1/3*`! (&! *7*&3*4=>!
0*&714/01(4!(6!' &*34/4=>#!
!
"4! @*0*&714143! 0. *! 6*7/<*&! 7*7A*&!)!
*4010<*7*40!0(!0. *!A*4*610!0. *!:::!). /<<
=(4)1@*&! (4<0! 0. ()*! =(40&1A%01(4)! ' /1@!

\U# 2/0*&410>! <*/B*!). /<<l A*! 3&/40*@! 0(! /!
d%/<461*@! 6*7/<*< E (&_*&! 14! *B*&>! 14)0/4=*! (6!
' &*34/4=>!71)=/;&&1/3*!(&!*7*&3*4=>!0*&714/01(4!
(6!' &*34/4=>!&*3/&@<*))!(6!6&*d%*4=>#!
!

N] KG!)!0. *!/= &(4>7!6(&!<*)A1/4!3/>!A1)*L%/4/4@!
0&/4)3*4@*&#! G. *)*! /&*! ' *&)(4)! E!0. ! @!B*&)*!
) *L%/4(&!*40/01(4!/4@!3*4@*&!@*40!0>!P: U] "T#!
!

"#\$%&!!

!

A

J=0)!

!!!!Q*' %A!J=0!RI WV!P2/34/!5/&0/!6(&!- (7*4T!!!!

!!!!' '#9CO!!

!!!!\$&(. 1A10*@!A>!Q#J#R, S, '! '#O!

J401CK%<>143!/ =0!(6!, VW9!' '#WW!

J401C2/1!(&@*!:' (%)*!/ =0!' '#R!

J401CQ/' *!N/E!' '#WW!

J401C: *L%/!D/&/))7*40!/ =0!' '#R!

!

K*4*610)!

!!!![@%=/01(4/! ' #WX!

!!!!^&143*!K*4*610)! ' #WS!

!!!!D(%)143!' '#WX!

!!!!2/0*&410>!N*/B*' '#WOCWR!

!!!!: (<(' /&*40!' '#1`!WX!WO!

!!!!: '* =1/!N*/B*' '#9!S!WI !

!

K%<>143!!

!!!!

!!!!- . /0!/&*!14=<%@*!' ' #WI !
!!!!

D/6CK<(@!A&(0. *&!)/4@!)1)0*&)' ' #WF!
D/&/))7*40!' ' #R!
D/&7!' ' #0!
!!!!\$. >)1=/<' ' #0!
!!!!\$>=. (<(31=/<' ' #0!
!!!!J)!10!&*</0*)!0!K%<<143!' ' #WWW!
D%)A/4@!' ' #F!WV!W, CW9!
!

h%@1=1/<)*&B1=*)!' ' #F!
!

u. %<' ' #W, !
!

N/A(&!N/E!!
!!!!5</))161=/01(4!(6!=*&0/14!</))*)!(6!E (&_*&)' ' #!!!!
!!!!WS!
!!!!Y1)=&1714/0(&>!/=<)' ' #WS!
N*/B*)!!
!!!!: ' *=1/<<*/B*!' ' #WI !
!!!!2/0*&410>' ' #WI CWO!
N*3/<: *' /&/01(4!' ' #F!WX!
N] KG!!
- . /0!)!N] KG8!' ' #WR!
Q*<B/4=*!0(!2/34/!5/&0/!6(&!- (7*4!' ' #!, V!
Y*614101(4!(6!: *L%/<0>' ' #!, V!
Q*=(34101(4!(6!&13. 0)' ' #WR!, V!
N1;/4!' ' #W, !
N(=/<] (B*&47*40!c410)' ' #WR!
!

2/34/!5/&0/!6(&!- (7*4!' ' #9!
2/&1/!5</&/!Y(=0&14*!' ' #WV!
2/)0*=0(7>' ' #WI !
!

\ /0%&/<K (&4!^1< 14(!' ' #W, !
\ (01=*!Q*d%1&*7*40!' ' #WO!
!

U66*4@*@!' /&0>' ' #O!WV!WW!
U66*4@*&!' ' #WV!WI !
!

\$*4/<0!*)!' ' #1!WI !
\$&*34/4=>!' ' #WI !
\$&()010%0*!' ' #WV!
\$>=. (<(31=/<@1)0&*)!' ' #R!
!
!
!