!

! "#$%&'( ) *+! * " , # - % ! # . - /'
0 . , , * " 0#%&'12 * * 0 34' - % ! #5 *'
% , * "#0 % - '# , % 6 * " 7 '% -) '0 8 &! 8 " %&'
1 . 5 * " *#6 - ! 7'

!

"#$%&! ' (&%)*!

! + #,#-! . /! 0# 1 !

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

M8#&O(/!?!!Y($K<,(!,8(!,)<C($!C(<&O!$%.()(<O&!&#,<%&$!:8%!#)(!%5,$<6(!,8(!)(#M8!%E!,8(!B/7/!3%&$,<,5,<%&R!!,8(!Z<)$,!L1(&61(&,!8#$!C#))(6!1%$,!#,,(1K,$!,%!$,%K!%5,$<6()$!E)%1!5$<&O!$,()(%,JK($!%)!1<$#KK)%K)<#,<&O!,8(<)!M5-,5)($!E%)!M%11()M<#-!O#<&/!+!

08<$!#),<M-(!%5,-<&($!-(O#-!C#,,-($!%.()!M5-,5)#-!$%.()(<O&,J!#&6!%EE()$!#&!#)O51(&,!#$!,%!:8J!,8(!-#:!$8%5-6!C(!M8#&O(6!,%!K)%,(M,!#O#<&$,!,8(!(=K-%<,#,<%&!%E!>#,<.(!L1()<M#&!<1#0()J!E%)!M%11()M<#-!K5)K%$($/!+!!Z<)$,R!,8(!K#K()!6(,#<-$!$(.()#-!-(O#-!C#,,-($!C(,:((&!>#,<.(!L1()<M#&$!#&6!M%)K%)#,<%&$/!!

\<08,$!M#--(6!E%)!,8(!(&6!%E!,8(!5$(!%E!>#,<.(!L 1 ()<M#&!<1#0()J!<&!$K%),$/!/!!
Y($K<,(!,8(!M#--R!,8(!K)#M,<M(!<$!$,<--!M%1 1%&!<&!#--!-(.(-$!%E!$K%),$/!0!!08(!
>3LL!8#$!1#6(!#!M%&M(),(6!(EE%),!,%!$,%K!,8(!5$(!%E!$5M8!&#1($/!1!!0(#1$!
-<N(!,8(!>%),8! Y#N%,#! Z<08,<&0! 7<%5=! M8#&0(6!<,$!&#1(!,%!,8(! Z<08,<&0!
4#:N$!#&6!7,/!"%8&Q$!M8#&0(6!E)%1!,8(!\(6!+#&!,%!,8(!\(6!7,%)1R!:8<-(!

$+",-# $(./,+*01'2$'(3.),$."4# !/#

7<%5=ℝ+0!

I&6<O(&%5$! M5-,5)($! 8#.(! C((&! #&! <&$K<)#,<%&! E%)! 1#&J! E#$8<%&! 6($<O&()$/-?! ! 08(! 5$(! %E! O(&()<M! K#,,()&$R! $,J-($! #&6! M%-%)$! M#&&%,! C(! ,)#6(1#)N(6R-!!C5,!5&6()!,8(!I&6<#&!L),$!#&6!3)#E,$!LM,R!#&J!K)%65M,!,8#,! M-#<1$!,%!C(!1#6(!CJ!,)<C#-!1(1C()$!15$,!C(!#5,8(&,<M/-+!!b(,R!15M8!%E!,8(! #KK#)(-!<&65$,)J!8#$!

,)#6(1#)N(6/-2!!08(!)(,#<-()!5$(6!,8(!&#1(!%&!%.()!FG!K)%65M,$R!<&M-56<&O!U(:(-)J!#&6!M-%,8<&O!<&!<,$!>#.#U%!3%--(M,<%&/·?!!08(!,)<C(!M-#<1(6!,8#,!,8(!>#.#U%!&#1(!:#$!6<$,<&M,<.(R!,85$!,8(!)(,#<-()Q$!5$(!:#$!6<-5,<&O!,8(!1#)N/·1!L-$%R!,8(!)(,#<-()!5$(6!,)<C#-!K#,,()&$!,%!1<1<M!,8(!M(),<E<(6!K)%65M,$!1#6(!CJ!>#.#U%!,)<C#-!1(1C()$!:8<M8!#)05#C-J!.<%-#,(6!,8(!I&6<#&!L),$!#&6!3)#E,$!LM,/·+!

08(!#)05 1 (&,!<&!M%5),!:#$!,%!:8(,8()!,8(!&#1(!e>#.#U%f!

L 1 ()<M#&! 7K<),?R·2!#-M%8%-R/?!#&6! 0# 1 C-<&O/'!!! 08($(! K)%65M,$! 8#. (! C((&! $,)<M,-J!)(05-#,(6!<&!,8(! K#$,! 65(!,%!,8(<)! $%M<#-! M%$,$/'+!! 4<$,%)<M#--JR! $5M8! K)%65M,$! 8#. (! C((&! .<(: (6! #$! .<-(! #&6! 5&M<. <-<T(6R! : 8<M8! 8#$! #-$%! C((&! #! $,()(%,JK(!E%)! >#,<. (! L 1 ()<M#&$/'·!

08(! 5$(!%E! >#,<. (! L 1 ()<M#&!< 1 #0()J!<&!#-M%8%-!#6. (),<$<&O!<$!($K(M<#--J! K)%C-(1 #,<M/'-!! S)<%)! ,%! ,8(! #))<. #-! %E! h5)%K(#&! $(,,-()$R! ,8()(! : #$! &%!)(M)(#,<%&#-! 5$(!%E!!#-M%8%-!# 1 %&O!,)<C($/'·!! 95,! h5)%K(#&!$(,,-()$! 5$(6!<,!<&! ,8(<)! ,)#6(! : <,8! I&6<#&$! #&6! <&,)%65M(6! 8<O8()! K)%%E! #-M%8%-! <&! M%K<%5$! # 1 %5&,$/''!! 08(!<&,)%65M,<%&!%E!#-M%8%-R!#-%&O! : <,8! 6<$(#$(R!<$!%E,(&!M<,(6!#$! #! 1 #<&! M%&,)<C5,%)!,%!,8(! 6(M< 1 #,<%&!%E!,8(!,)<C#-! K%K5-#,<%&/'0!! A%&O! #E,()! ,8(!,)<C($! : ()(! E%)M(6! E)% 1 !,)#6<,<%&#-! -#&6$! #&6! -<E($,J-($R! ,8(! #C5$(! %E! #-M%8%-!)%$(! 6($K<,(!,8(! E#M,!,8#,! E(6()#-!-# : ! C-%MN(6!,8(! $#-(! %E! #-M%8%-! %&!)($(). #,<%&$! 5&,<-! H]c_/'1!

I&! H]]GR!,8(! > (: ! b%)N! C#$(6! -<V5%)! M% 1 K#&J! 4%)&(--! 9)(: <&O! C(O#&! K)%65M<&O!,8(! 3)#TJ! 4%)$(! + #-,! A<V5%)R! : 8<M8!<,! 6<$,)<C5,(6! <&!,8<),J! %&(! $,#,($/'2!! 08(! 1 #-,!-<V5%)! : #$!-#C(-(6! e3)#TJ! 4%)$(f! #&6!,8(! C%,,-(! <&M-56(6!

#

" XV?" T%(55*"Y]/'1P(."*)" (1?."*>1Z"--1%A.9I5',D%C(5"BB,1B,("'(1.%1:%*+$,(-".%A.9("./I0'I,$% ".9%>,"9('(1."0%>1Z"--1;%A3B&443$23*;'3<"Fa*O?"@V."GH@ZL."0))M$JNN)%O(&&%&%5),%1?O3I?&%3N

#!M#),%%&!%E!#&!I&6<#&!<&!#!8(#66)($$R!#!C5MN<&O!8%)$(R!#$!:(--!#$!,8(!:%)6$!e9-#MN!4<--$!A,6/f0?!!08(!h$,#,(!%E!0#$5&N(![<,N%!;N&%:&!CJ!,8(!h&O-<$8!&#1(!3)#TJ!4%)$(?!#&6!,8(!9)5-(!A#N%,#!%E!,8(!\%$(C56!7<%5=!0)<C(R!$5(6!,8(!C)(:<&O!M%1K#&J!E%)R!<&,()!#-<#R!&(O-<O(&,!<&E-<M,<%&!%E!(1%,<%&#-!6<$,)($$R!6(E#1#,<%&!#&6!#!.<%-#,<%&!%E!)<O8,!,%!K5C-<M<,J/0!!

08(!,)<C(!6<$#KK)%.(6!,8(!5$(!%E!,8(!&#1(!E%)!$(.()#-!)(#$%&$R!<&M-56<&O!,8(!-%&O!8<$,%)J!%E!#-M%8%-!#C5$(!%&!)($().#,<%&$!#&6!,8(!E#M,!,8#,!,8(!3)#TJ!

:8%!6<6!&%,!8#.(!M%&,#M,!:<,8!,8(!)($().#,<%&/[1?]!!08(! !75K)(1(!3%5),!8(-6!,8#,!,)<C#-!M%5),$!8#6!U5)<$6<M,<%&!#$!,8(!C)(:()!8#6!#6.(),<$(6!<&!7%5,8!Y#N%,#!#&6!<E!<,!&((6(6!,%!%C,#<&!K()1<$$<%&!,%!5$(!#!-<N(&($R!<,!:%5-6!)(V5<)(!,8(!C)(:()!,%!1#N(!M%&,#M,!:<,8!,8(!,)<C(/[1!]!!08(!M%5),!#-$%!E(-,!,8#,!,8(!5$(!%E!,8(!3)#TJ!4%)$(!&#1(!1#J!M)(#,(!#!E#-$(!#$$%M<#,<%&!:<,8!,8(!7<%5=/[1+]!

08(!C)(:()!$%5O8,!#&!<&U5&M,<%&!#O#<&$,!,)<C#-!U5)<$6<M,<%&!<&!E(6()#-!M%5),/[1,]!!08(!h<O8,8!3<)M5<,!)5-(6!#O#<&$,!,8(!,)<C#-!M%5),R!$,#,<&O!,8#,!5&6()!,8(! !(=M(K,<%&$R!,8(!,)<C(!6<6!&%,!8#.(!U5)<$6<M,<%&!#$!,8()(!:()(!&%!$#-($!%&!)($().#,<%&!-#&6!&%)!:#$!,8()(!#!M%&$(&$5#-!)(-#,<%&$8<K!C(,:((&!,8(!,)<C(!#&6!,8(!6(E(&6#&,/[1-]!!08(!M%5),!$,#,(6!,8#,!,8(!,)<C(!M%5-6!$5(!<&!E(6()#-!M%5),/[1·]!

08(!,)<C(!,8(&!C)%5O8,!,8(!M#$(!<&!E(6()#-!M%5),!<&!7%5,8!Y#N%,#R!#&6!,8(!6<$,)<M,!M%5),!6(&<(6!,8(!C)(:()Q$! M#--! E%)! 6<$1<$$#-! C#$(6! %&! -#MN! %E!U5)<$6<M,<%&/[1/]!!L)%5&6!,8<$!,<1(R!,8(!C)(:()!:#$!C%5O8,!%5,!CJ!7,)%8Q$!9)(:<&O/[10]!!08(!&(:!M%1K#&J!6(M<6(6!,%!$(,,-(!,8(!M#$(!:<,8!,8(!,)<C(!<&!,8(!A#N%,#!,)#6<,<%&/[11]!!08(!$(,,-(1(&,!)(V5<)(6!,8(!C)(:()!,%!,)#.(-!,%!,8(!\%$(C56!7<%5=!\($().#,<%&!#&6!E%)!,8(!%:&()%E!7,)%8Q$!,%!)(#6!#&!#K%-%OJ/[12]!!4(!#-$%!K)($(&,(6!#!O<E,!%E!C-#&N(,$R!C)#<6$!%E!$:((,0)#$$R!,%C#MM%!#&6!$(.(&!8%)$($!,%!,8(!#61<&<$,)#,%)!%E!,8(!3)#TJ!4%)$(!($,#,(/[2?]!08()(!:#$!&%!1%&(,#)J!(=M8#&O(/[2!]!

#

" ZH?" b$)()*"%-"A($45D*" \ ')D%."GI"U57'(5"Q?"`*M?"K@HW"F`%$*O47"/'%4h"/4M?"2)?"@VVKL?"

% Z@<% A9<"()"K@@@?"

% ZG<% A9<""

" ZI?" C%,5*11"^,*='5>"2%?"P?"`%$*O47"/'%4h"A,'O(1"2)?."@II"a?I7"@HZS"FZ)0"2',?"@VVZL?"

% ZW<% A9<"()"@HVH;@HV@"FZ)0"2',?"@VVZL"F%P*,)4,5'5>"7'$),'&)"&%4,)"(57",*3(57'5>L?"

% ZX<% A9<"()"@HVI"FZ)0"2',?"@VVZL?"

" ZK?" b$)()*"%-"\ ')D%"P?"C%,5*11"^,*='5>"2%?."@XK"a?"/4MM?"G7"@HVG"FY?/?Y?"GHH@L"F-'57'5>")0()"

)0*"-*7*,(1"&%4,)"7'7"0(P*"l4,'$7'&)'%5"%P*,")0*"&%3M(5BL?"

" ZS?" +%33*,$0*'3."5*IB*, "%5%)*"KV."()"XV?"

% ZZ<% A9<"

% ZV<% A9<%

% VH<% A9<%

% V@<% A9<"

III/! A-3/+*I.0-%(.-!",*"$*S#$"-'"(!3*3&+"&#/+*7$2-#-(3!"4!

[8(&!<,!M%1($!,%!K)%,(M,<&O!<&,#&O<C-(!M5-,5)#-!K)%K(),JR!<,!<$!&(#)-J!<1K%$$<C-(!E%)!,)<C($!,%!:<&!#&J!-(O#-!M-#<1$/2+!!08(!<1#O($R!&#1($!#&6!$J1C%-$!,)<C($!:%5-6!:#&,!,%!K)%,(M,!#)(!1%$,!%E,(&!K#),!%E!#!M%--(M,<.(!,8#,!8#.(!(.%-.(6!%.()!1#&J!O(&()#,<%&$/2,!!08<$!<$!#&,<,8(,<M#-!,%!L1()<M#&!#&6!<&,()&#,<%&#-!<&,(--(M,5#-!K)%K(),J!-#:!:8<M8!K)%,(M,$!,8(!)<08,$!%E!<&6<.<65#-!K()$%&$!%)!(&,<,<($!#&6!O<.($!E<&<,(!,()1$!%E!K)%,(M,<%&/2-!

3%11()M<#-!$K((M8!K)%,(M,<%&!(1()O(6!)(-#,<.(-J!)(M(&,-J!<&!B/7/!U5)<$K)56(&M(/2·!!Z%)!1#&J!J(#)$R!M%11()M<#-!$K((M8!6<6!&%,!8#.(!#&J!K)%,(M,<%&!C(M#5$(!<,!:#$!$K((M8!5$(6!,%!$((N!K)%E<,!#&6!M%5-6!C(!5$(6!,%!6(M(<.(!M%&$51()$/2/!!95,!<&!#!$()<($!%E!M#$($!<&!,8(!H]`G$R!,8(!B/7/!75K)(1(!3%5),!(=K#&6(6!K)%,(M,<%&!E%)!M%11()M<#-!$K((M8R!,8%5O8!<,!$,<--!)(M(<.($!-($$!K)%,(M,<%&!,8#&!&%&@M%11()M<#-!$K((M8/20!!I&!R21!,8(!B/7/!75K)(1(!3%5),!M)(#,(6!#!-(O#-!,($,!#$!,%!:8(&!,8(!O%.()&1(&,!M#&!)(O5-#,(!M%11()M<#-!,)5,8E5-!$K((M8!)(O#)6<&O!-(O#-!K)%65M,$W!

6<)(M,-J!#6.#&M($!,8#,!<&,()($,/!?1!!95,!<&!E5-E<--<&O!,8(!,8<)6!K)%&OR!,8(!B/7/! 75K)(1(!3%5),!8#$!C((&!-($$!:<--<&O!,%!O%!:<,8!,8(!O%.()&1(&,Q$!#)051(&,/!! 08(!3%5),!8#$!$#<6!,8#,!,8()(!1#J!C(!#!-($$!)($,)<M,<.(!#-,()&#,<.(!#.#<-#C-(R! C5,!,8(!O%.()&1(&,!M#&&%,!)($,)<M,!1%)(!$K((M8!,8#&!&(M($$#)J/!?+! 08(! B/7/! 75K)(1(! 3%5),! 8#$!)(M(&,-J! $,)5MN! 6%:&! $(.()#-! -#:$! #,,(1K,<&O!,%!)(05-#,(!#6.(),<$<&O!%E!M<O#)(,,($!?·!#&6!#-M%8%-!?·-!C(M#5$(!,8(J! :()(!1%)(!(=,(&$<.(!,8#&!&(M($$#)J/!!+%)(%.()R!<&! R!?·-! ,8(!3%5),!8(-6!,8#,!#!)(05-#,<%&!#<1(6!#,!M%11()M<#-!$K((M8!C(M#5$(!<,!<$! M%11()M<#-R! 1#J!C(!#!M%&,(&,@C#$(6!)(05-#,<%&!$5CU(M,!,%!$,)<M,!$M)5,<&JR!)#,8()!,8#&!<&,()1(6<#,(!$M)5,<&J!K5)$5#&,!,%! /!?/·!!I&!6%<&O!$%R! ,8(!3%5),!1#J!8#.(!8<&,(6!,%:#)6$!1%)(!K)%,(M,<%&!%E!M%11()M<#-!$K((M8!<&! ,8(!&(#)!E5,5)(R!(.(&!K#)#--(-<&O!K%-<,<M#-!$K((M8!K)%,(M,<%&$/!?0! [8(&!<,!M%1($!,%!#KK-J<&O!,8(! !,($,!,%!M#$($!%E! M%11()M<#-!(&,<,<($!5$<&O!>#,<.(!L1()<M#&!<1#O()JR!<,!$((1$!5&-<N(-J!,8#,!)<C($!M%5-6!(.()!K)(.#<-/!?1!!Z<)$,R!,8(!#6.(),<$(1(&,$!#)(!&%,!1<$-(#6<&O! 5&-($$!,8(J!M-#<1!,%!C(!K)%65M,$!1#6(!CJ!#!,)<C(!%)!,)<C#-!1(1C()/!?2!! L66<,<%&#--JR!,8(!O%.()&1(&,!1#J!8#.(!-#56#C-(!6($<)(!,%!K)%,(M,<&O!M5-,5)#-! $%.()(<O&,JR!C5,!<,!M#&&%,!K-#M(!M%&,(&,@C#$(6!)(05-#,<%&/!!!h.(&!<E!<,!:#$!#! $5C$,#&,<#-!$,#,(!<&,()($,R!#!M%1K-(,(!C#&!%&!$5M8!$K((M8!<$!&(.()!&#))%:-J! ,#<-%)(6!,%!#M8<(.(!,8#,!O%#-/!!!!

#

" @H@?" 6'1*5(" 6'D('1%P(."*9)$,'(5(.3% ".9% /2(092119% OZ$5('D@% >2$% 410$% 1:% '2$% !9,"0% `1)$,.+$.'%(.%K(+('(.3%/2(09,$.Q5%JdB15I,$%'1%F.2$"0'2D%!119%*9)$,'(5$+$.'5;"KK$a#(?$2 3 7 7?$ Q?T?$IGS."IWV"FGH@WL?"

" @HG?" ^7?"%-"A,$?"/)()*"85'P?"%-"9?:?"P?"a%h."WVG"8?/?"WKV."WSZ"F@VZVL?"

% @HI<% 6$$;%$<3<.% Q%,'11(,7" P?" `*'11B." XII" 8?/?" XGX." XK@;XKI" FGHH@L" F0%17'5>")0()" &'>(,*))*" ,*>41()'%5$"7'7"5%)"$4,P'P*"'5)*,3*7'()*"$&,4)'5BL?"

% @HW<% 6$$;%$<3<."Q's4%,3(,)."U5&?"P?"`0%7*"U$1(57."X@S"8?/?"WZW."XHS;XHZ"F@VVKL"F0%17'5>")0()" (1&%0%1",*>41()'%5"7'7"5%)"$4,P'P*"'5)*,3*7'()*"$&,4)'5BL?"

" @HX?" XKW" 8?/?" XXG." XXS" FGH@@L" F0%17'5>")0()" m*,3%5)"1(=",*$),'&)'5>")0*"$(1*"%-"M0(,3(&B" ,*&%,7$"&%5)('5'5>"'7*5)'-'(O1*"'5-%,3()'%5"-%,"M4,M%$*$"%-"3(,D*)'5>"=($"45&%5$)')4)'%5(1L?"

% @HK<% A9<"()"XKX;XKS?"

% @HS<% 6$$"U$(O*11*"^'O*); f(1'5B(D."*%/,('(-"0%*."0D5(5%1:%61,,$00%)<%AC6%G$"0'2;%A.-<@%P".91,"Q5% M1d%""%M$5'."KS$a33($_$Y'%>$Q?T?"@V@"FGH@GLd"A(3(,("`?"+'*)B."R*%&$-$55",D%/15%1:%!,$$91+?H% >2$%A.-12$,$.-$%1:%61,,$00%)<%AC6."KW"#<&?%Q?$`#:?"@"FGH@GL?"

" @HZ?" T*--,*B"Q*-$)'5.%81$5%'2$%!(,5'%*+$.9+$.'%M",%/".-$00"'(1.%1:%495#(.5H."XG"/;&*?

0)<C($! 8#6! #,,(1K,(6! ,%! 5$(! ,8(! A#&8#1! LM,!!+! :8<M8! C-%MN$! ,8(!)(O<$,)#,<%&!%E!6<$K#)#O<&O!1#)N$/!!,!!08<$!$(M,<%&!%E!,8(!-#:!8#6!#--%:(6!E%)!M8#--(&O($!%&!,:%!M#5$($!%E!#M,<%&W!H?!#!1#)N!,8#,!M%&,#<&$!e<11%)#-R!6(M(K,<.(R!%)!$M#&6#-%5$!1#,,()jikf!!-!%)!F?!#!1#)N!,8#,!<$!6<$K#)#O<&O!%)!E#-$(-J!$5OO($,$!#!M%&&(M,<%&!:<,8!K()$%&$R!<&$,<,5,<%&$R!%)!C(-<(E$/!!·!!7M#&6#-%5$!1#)N$!:()(!,8%$(!,8#,!:%5-6!8#.(!C((&!M%&$<6()(6!,%!%EE(&6!,8(!

I&6<#&!0)<C($!#)(!M%&$<6()(6!,%!C(!(=,)#@M%&$,<,5,<%&#-/!+,!!Z%)!,8(!E<)$,!E%5)!6(M#6($!%E!,8(!\(K5C-<MR!,8(!B/7/!^%.()&1(&,!,)(#,(6!,)<C($!#$!$(K#)#,(!$%.()(<O&$!:<,8!:8%1!,8(J!:%5-6!1#N(!,)(#,<($!#&6!,)#6(!#0)((1(&,$/!+-!!I&!,8(!Hm_G$R!,8(!+#)$8#--!0)<-%0J!+·!$8#K(6!,8(!M%&,%5)$!%E!,8(!M%1K-(=!)(-#,<%&$8<K!C(,:((&!,)<C($!#&6!,8(!B/7/!^%.()&1(&,/!Z<)$,R!5&6()!,8(!,(&5%5$!-(0#-!6%M,)<&(!%E!6<$M%.()JR!+/!,8(!,)<C($!:%5-6!C(!$((&!#$!6%1($,<M!6(K(&6(&,!&#,<%&$!:<,8<&!,8(!B/7/!+0!!085$R!,8(!$,#,($!M%5-6!&%,!)(05-#,(!,8(!,)<C($R!#&6!%&-J!,8(!E(6()#-!0%.()&1(&,!:%5-6!8#.(!K-(&#)J!K%:()$!%.()!,8(!,)<C($/!+1!!I&!,8<$!)(-#,<%&$8<KR!,8(!E(6()#-!0%.()&1(&,!:%5-6!8#.(!#!,)5$,!)($K%&$<C<-<,J!,%!K)%1%,(!,8(!:(-E#)(!%E!,8(!,)<C($R!:8<M8!:#$!#!$,#,5$!,8(!,)<C($!8#6!#MV5<)(6!,8)%508!,)(#,<($!<&!M%&$<6()#,<%&!%E!0<.<&0!5K!-#&6!#&6!#C$%-5,(!$%.()(<O&,J/!+2!

95,!E%)!1%$,!%E!B/7/!8<$,%)JR!,8(!E(6()#-!0%.()&1(&,!6<6!&%,!E5-E<--!<,$!,)5$,!)($K%&$<C<-<,J/!+,?!!08(!0%.()&1(&,!M%&$<$,(&,-J!#&6!5&<-#,()#--J!.<%-#,(6!,)(#,<($!:8(&!,8(!,()1$!&%!-%&0()!$5<,(6!,8(1/!+,!!+%)(%.()R!,8(!B/7/!75K)(1(!3%5),!8#6!8(-6!,8#,!,8(!K-(&#)J!K%:()$!&%,!%&-J!#--%:(6!,8(!0%.()&1(&,!,%!)(1%.(!,)<C($!E)%1!,8(<)!#C%)<O<&#-!-#&6$R!+,!C5,!#-$%!,%!

% @GI<% 6$$"/(5)("21(,("+4*O1%"P?"6(,)'5*c."WIK"8?/?"WV."XK;XZ"F@VSZL"F&')'5>")0()")0'$"0($"O**5"*h)*57*7")%")0*"^'11"%-"`'>0)$"(57"@W

)(1%.(!,)<C#-! 1(1C()$! E)%1!,8(!)($().#,<%&$! E%)! #$$<1<-#,<%&! #&6!,%!,()1<&#,(!,8(!-(O#-!$,#,5$!%E!1#&J!,)<C($!:8(&(.()!<,!K-(#$(6/!,,!

[<,8!,8(!I&6<#&!\(%)O#&<T#,<%&! LM,!%E!H]_aR!,-!,8(!)(1#<&<&O!,)<C#-!&#,<%&$! <&!,8(! B/7/! C(O#&!,%! E%)1!O%.()&1(&,$!,8#,!)($(1C-(6!:($,()&!O%.()&1(&,!;(/O/!,8)((! C)#&M8($R! (-(M,(6!-(#6()$R! :)<,,(&!-#:$R! (,M/?/!,,!!08%508!,8(!,)<C#-!O%.()&1(&,$!8#6!1%)(!:($,()&@$,J-(!O%.()&1(&,$R!,8(J!$,<--!-#MN(6!U5)<$6<M,<%&!%.()!&%&@,)<C#-!1(1C()$!<&!1%$,!M#$($/!,/!!Z%)!(=#1K-(R!<&!M)<1<&#-!M#$($R!,8(!E(6()#-!O%.()&1(&,!8#$!U5)<$6<M,<%&!<&!1%$,!E(-%&J!M#$($/!,0!!IE!,8(!K()K(,)#,%)!<$!&%&@

#!)(M(&,!$(,!%E!M#$($R!,8(!3%5),!8#$!-<1<,(6!,8(!(=,(&,!%E!,)<C#-!U5)<$6<M,<%&!%.()!&%&@I&6<#&$!<&!M<.<-!1#,,()$/!-!

0)<C($!#)(!$,<--!(=,)#@M%&$,<,5,<%&#-R!C5,!<&!H]gmR!3%&O)($$!K#$$(6!,8(!I&6<#&!3<.<-!\<08,$!LM,!;I3\L?!:8<M8!1%$,-J!1<))%)(6!,8(!9<--!%E!\<08,$R!<&M-56<&O!,8(!K)%,(M,<%&!E%)!,8(!E)((6%1!%E!$K((M8/!-/!!

%,8()$!1<$5$(!,8(!K)%65M,!E%)!O#<&!%)!5&U5$,!(&)<M81(&,/!·-!!95,!:8#,!#C%5,!K)%K(),J!,8#,!:#$!M)(#,(6!CJ!#!6<$,<&M,!M5-,5)(!#&6!,8(&!1<$#KK)%K)<#,(6!CJ!#!K(%K-(!:8%!#)(!&%,!%E!,8#,!M5-,5)(2#)(!,8()(!#&J!K)%,(M,<%&$X!

>#,<.(!L1()<M#&!,)<C($!:()(!,8)5$,(6!<&,%!#!K%-<,<M#-@-(O#-!$,)5M,5)(!,8#,!8#$!#--%:(6!E%)!,8(!O%.()&1(&,!,%!,#N(!-#&6!#&6!$%.()(<O&,J!<&!,8(!&#1(!%E!M<.<-<T<&O!,8(!I&6<#&/!·!!B/7/!75K)(1(!3%5),!U5)<$K)56(&M(!8#$!-(O<,<1<T(6!,8(!,#N<&O!%E!,)<C($Q!)(#-!K)%K(),JR!·/!$%!<,!<$!&%!$5)K)<$(!,8#,!%5)U5)<$K)56(&M(!#-$%!#--%:$!E%)!M%)K%)#,<%&$!,%!1<$#KK)%K)<#,(!,)<C#-!M5-,5)#-!K)%K(),J!#&6!$%.()(<O&,J!#$!:(--/!·0!

I&$K<)#,<%&!M#&!M)(#,(!&(:!#),<$,<M!(=K)($$<%&$R!:8<M8!<$!#!)($5-,!,8#,!<&,(--(M,5#-!K)%K(),J!-#:!$,)<.($!,%!K)%,(M,/!·1!!95,R!<&!,8(!(=#1K-($!#C%.(R!<,!$((1$!-($$!-<N(!<&$K<)#,<%&!#&6!1%)(!-<N(!M%@%K,<&O!%)!(.(&!$,(#-<&O/!·2!!+%)(%.()R!:<,8!5$($!$5M8!#$!\(6$N<&$!%)!>#.#U%!Z-#$N!%)!3)#TJ!4%)$(!+#-,!A<V5%)R!<,!<$!6(1(#&<&O!#&6!6<$K#)#O<&O!%E!#&!5&6())(K)($(&,(6!O)%5K/!·?!!

,8<$!%&(/!+%)(%.()ℝ!,8(!%,8()!5$($!#)(!6<ⅇⅇ()(&,/!!7%1(!0)%5K$!&%!-%&O()!(=<$,!;(/O/!d<N<&0$?/!/·!!D&(!%E,@M<,(6!(=#1K-(!%E!K(%K-($!:8%!6%!(=<$,!<$!,8(!>%,)(!Y#1(!Z<08,<&O!I)<$8/!95,!,8(!B&<.()$<,J!%E!>%,)(!Y#1(!:#$!($,#C-<$8(6!#$!#&!I)<$8@3#,8%-<M!$M8%%-/!//!!I&!1%$,!M#$($!%E!>#,<.(!L1()<M#&!<1#0()Jℝ!,8(!K)%65M()!<$!&%,!>#,<.(!L1()<M#&/!!

%E!,)<C#-!M5-,5)(!;(/0/! [#$8<&0,%&! \ (6$N<&$R!7K<)<,!3<0#)(,,($R!>#.#U%!Z-#NR! 3)#TJ!4%)$(!A<V5%)R!(,M/?/'[10]!

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

K)%K(),J!<&!,)5$,!$,#,5$!E%)!,8(!,)<C($/+?0!!9(M#5$(!%E!,8<$R!:8(&!<,!M%1($!,%!

,)<C($!M#&!#.%<6!,8(!5&M(),#<&!E5,5)(!%E! !#$!,8(!B/7/!75K)(1(!
3%5),!O<.($!1%)(!K)%,(M,<%&!,%!M%)K%)#,(!$K((M8/+!0!

d/**3$!'+&,($!!

4#.<&O!6<$,<&M,!M#,(O%)<($!%E!%:&()$8<K!E%)!K)%K(),J!<$!eM%5&,()<&,5<,<.(!
E%)!,)<C#-!K(%K-($/f+!1!!0)<C($!%E,(&!,#N(!#!1%)(!M%--(M,<.<$,!#KK)%#M8!,%!,8(!
%:&()$8<K!%E!K)%K(),J!C%,8!)(#-!#&6!<&,(--(M,5#-/+!2

K)%.<6(!E%)!E)((!$K((M8!)<O8,$!K5)$5#&,!,%!I3 \ L$^{+,?}$!!C5,!#&J!E)((!$K((M8!6(,()1<&#,<%&! :%5-6!E%--%:!,)<C#-!-#:/$^{+,!}$!!h=,(&6<&O!,8(!,)<C#-!M%5),Q$!U5)<$6<M,<%&!,%!&%&@,)<C#-!1 (