

ç<8I)<:IL(@K<Iâ

á8DNI@K@P@Q<K19<t8LJ<F=DPJKIFE@EK<I@E9K8@E@PCLK@TC:@8C@UK@K@HH@EKCPá
8D<DGCFFP<8J*F=KN8I@L8C@K@P8CPJ@K+I8EJ=@E;N?<I<á8CJNFIBFE;<M<CFGD<EKN<C@LKF8K@P@E
JF=KN8I<á

á8D @EK<I<J@K?>@FJ@K@PFLJ<ä8CN8PN8EK<K@P<8;<M<CFGJ@E:áJK8IK4J@E@FDGLK<@E@K
 <OKI<D<@P?>@C8I8K@E@8K@FCLK@K@8IKI<LJ<=L@K@8;M8E:<?LD8E@K@PFD<N8PääEK?<LII<EK<:>EFCF>P
 FI@<EKN@FIC;@<@E8*F=KN8I@E>@E<8E; (L8C@K@P8CPJ@K@8M<8 GFN<I=L8G89@C@K@P<KFN8I;JK?<
 ;<M<CFGD<@K<C@K<JK@E@E<NJF=KN8I@K@<@E89C<KD8B<M<@B JD8C@DG8@K<J8 CFE>N8P8E; á8JG@K@F
 9<G8I@E=K?@N@FLIE<@B@EP=FIDá:8EàY@CJFää78M<9<<E@B*F=KN8I@L8C@K@P8CPJ@K@FIK?<G8J@P<8IFIJFä
 +?IFL?>FLK?>@á8M<4<<E8E; 9<<E8 G8I@E=K?<M<CFGD<@K@P<C<M<IPC@FJ<C@P@M<K@K?<@OK<EK@F@E>
 ;<M<CFGD<@KIBää78M<9<<EN@FIB@B@E<M<CFGD<@K@8L8KFD8K@P@P@K?<G8JK@FLGC@F=D@FEK?>Jä

ýJ PFL:8E J<=<IFDDP <E:CFJ<JLD<ä 78M<=>I8;L8K<N@KSJK<I>J<=>I<=<@FDGLK<†@<E:<IFD*K8K<
,E@M<IJ<KPK<N0FIBäY C98EP5P 8I<8F=JG<:@8C@Q8K08H8a<E:äYIFEKä<E:M<CFG@8E>K<JK@E8CJNFIB<;
8J 8E@EK<8K8E=FID8K@FE7EFCF>8E; *IM@<:äG8IKD<HK%<N0FIB *K8KLI@EDP D8JK<I>L8CJNFIB<;FE
8I<J<8I:>GIFA<KE;<I>I8;L8K GIF=JFJ8J 8;<M<CFG<8a 8:8;<D@<NFIB<OG<I@<P8J GIFM@>D<N@KTB@C8FI
9<KKI8E;<IJK8E;@F>ÜFDGLK<†@<E:<@K>JG<:@8C@Q8KID8H8a<N@K@M<I8F;@<F=K8C<8KDLCK@GC<
<FDG8E@8CJGIFM@>D<89@C8K8FIBN@K2KCLIK8C@M<I8FGLC8K8F8EäOG<I@<E=FD8:8;<D@>:IFLG
GIFA<K8J 7E<FE; DP<FDDLE:8K@K8F@CEI K8L>78M<8CL89C<JFE@H8C89F18K8E@E@K@88C@FEäN8K
DP JB@CBIFN<C>8E: 8:8;<D@>K18@E88CEFD<KFEKEI@9IK8PFLIFI>8E@Q8K@FEä

0FL D8P1<8? D<8KK?<4aD8@C;I<JJ /D<<KJ?8?iëëü>D8@Ca:FD;8EK<C<G?FEkD9<I/ëçaiÄaÄiëÄ;äN@9C
?8GGIKFD8B<DPJ<C8M8@C89E8E@EK<IMK?<NIK?<@J:LJJP 98:B>IFLE;äHL8C@=@:8KOGFI@<8E;
@EK<I<JKJa
$$*(@)E: <I < CP \hat{a}$$

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ç<8I)<:IL(@K<Iâ

á8DNI@K@P@C<K19<t8LJ<F=DPJKIFE@EK<I@E9K8@E@PCLK@TC:@8C@UK@K@HH@EKCPá
8D<DGCFFP<8J*F=KN8I@L8C@K@P8CPJ@K+I8EJ=@E;N?<I<á8CJNFIBFE;<M<CFGD<EKN<C@LKF8K@P@E
JF=KN8I<á

á8D @EK<I<J@K?>@FJ@K@PFLJ<ä8CN8PN8EK<K@P<8;<M<CFGJ@E:áJK8IK4J@E@FDGLK<@E@K
 <OKI<D<@P?>@C8I8K@E@8K@FCLK@K@8IKI<LJ<=L@K@8M8E:<?LD8E@K@PFD<N8PääEK?<LII<EK<:>EFCF>P
 FI@<EKN@FIC;@<@E8*F=KN8I@E>@E<8E; (L8C@K@P8CPJ@K@8M<8 GFN<I=L8G89@C@K@P<KFN8I;JK?<
 ;<M<CFGD<@K<C@K<JK@E@E<NJF=KN8I@K@<@E89C<K@D8B<M<@B JD8C@DG8@K<J8 CFE>N8P8E; á8JG@K@F
 9<G8I@E=K?@N@FLIE<@B@EP=FIDá:8EàY@CJFää78M<9<<E@B*F=KN8I@L8C@K@P8CPJ@K@FIK?<G8J@P<8IFI JFä
 +?IFL>?FLK?>@á8M<4<<E8E; 9<<E8 G8I@E=K?<M<CFGD<@K@P<C<M<IPC@FJ<C@P@M<K@K?<@OK<EK@F@E>
 ;<M<CFGD<@KIBää78M<9<<EN@FIB@B@E:<M<CFGD<@K@8L8KFD8K@P@FDK?<G8JK@FLGC@F=D@FEK?Jä

ýJ PFL:8E J<=<IFDDP <E:CFJ<JLD<ä 78M<=>I8;L8K<N@KSJK<I>J<=>I<=<@FDGLK<†@<E:<IFD*K8K<
,E@M<IJ<KPK<N0FIBäY C98EP5P 8I<8F=JG<:@8C@Q8K08H8a<E:äYIFEKä<E:M<CFG@8E>K<JK@E8CJNFIB<;
8J 8E@EK<8K8E=FID8K@FE7EFCF>8E; *IM@<:äG8IKD<HK%<N0FIB *K8KLI@EDP D8JK<I>L8CJNFIB<;FE
8I<J<8I:>GIFA<KE;<I>I8;L8K GIF=JFJ8J 8;<M<CFG<8a 8:8;<D@<NFIB<OG<I@<P8J GIFM@>D<N@KTB@C8FI
9<KKI8E;<IJK8E;@F>ÜFDGLK<†@<E:<@K>JG<:@8C@Q8KID8H8a<N@K@M<I8F;@<F=K8C<8KDLCK@GC<
<FDG8E@8CJGIFM@>D<89@C8K8FIBN@K2KCLIK8C@M<I8FGLC8K8F8EäOG<I@<E=FD8:8;<D@>:IFLG
GIFA<K8J 7E<FE; DP<FDDLE:8K@K8F@CEI K8L>78M<8CL89C<JFE@H8C89F18K8E@E@K@88C@FEäN8K
DP JB@CBIFNC<;>8E: 8:8;<D@>K18@E88CEFD<KFEKEI@9IK8PFLIFI>8E@Q8K@FEä

0FL D8P1<8? D<8KK?<4aD8@C;I<JJ /D<<KJ?8?iëëü>D8@Ca:FD;8EK<C<G?FEkD9<I/ëçaiÄaÄiëÄ;äN@9C
?8GGIKFD8B<DPJ<C8M8@C89E8E@EK<IMK?<NIK?<@J:LJJP 98:B>IFLE;äHL8C@=@:8KOGFI@<8E;
@EK<I<JKJa
$$*(@)E: <I < CP \hat{a}$$

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ç<8I)<:IL(@K<Iâ

á8DNI@K@P@C<K19<t8LJ<F=DPJKIFE@EK<I@E9K8@E@PCLK@TC:@8C@UK@K@HH@EKCPá
8D<DGCFFP<8J*F=KN8I@L8C@K@P8CPJ@K+I8EJ=@E;N?<I<á8CJNFIBFE;<M<CFGD<EKN<C@LKF8K@P@E
JF=KN8I<á

á8D @EK<I<J@K?>@FJ@K@PFLJ<ä8CN8PN8EK<K@P<8;<M<CFGJ@E:áJK8IK4J@E@FDGLK<@E@K
 <OKI<D<@P?>@C8I8K@E@8K@FCLK@K@8IKI<LJ<=L@K@8;M8E:<?LD8E@K@PFD<N8PääEK?<LII<EK<:>EFCF>P
 FI@<EKN@FIC;@<@E8*F=KN8I@E>@E<8E; (L8C@K@P8CPJ@K@8M<8 GFN<I=L8G89@C@K@P<KFN8I;JK?<
 ;<M<CFGD<@K<C@K<JK@E@E<NJF=KN8I@K@<@E89C<K@D8B<M<@B JD8C@DG8@K<J8 CFE>N8P8E; á8JG@K@F
 9<G8I@E=K?@N@FLIE<@B@EP=FIDá:8EàY@CJFää78M<9<<E@B*F=KN8I@L8C@K@P8CPJ@K@FIK?<G8J@P<8IFIJFà
 +?IFL>?FLK?>@á8M<4<<E8E; 9<<E8 G8I@E=K?<M<CFGD<@K@P<C<M<IPC@FJ<C@P@M<K@K?<@OK<EK@F@E>
 ;<M<CFGD<@KIBää78M<9<<EN@FIB@B@E<M<CFGD<@K@8L8KFD8K@P@P@K?<G8JK@FLGC@F=D@FEK?Jà

ýJ PFL:8E J<=<=IFDDP <E:CFJ<JLD<ä 78M<=>I8;L8K<N@KSJK<I>J<=>I<=<@FHDGLK<1@<E:<=IFD*K8K<
,E@M<IJ@KPK<N0FIBäY C98EP5P 8I<8F=JG<:@8C@Q8K8H8Ea<E:äYIFEKa<E:M<CFG@8E>K<JK@E8CJNFIB<;
8J 8E@EK<8KE=FID8K@FE7EFCF>8E; *IM@<:äG8IKD<HK%<N0FIB *K8KLI@EDP D8JK<I>L8CJNFIB<;FE
8I<J<8I:>GIFA<KE;<I>I8;L8K GIF=JFJ8J 8;<M<CFG=8E 8:8;<D@<NFIB<OG<I@<P8J GIFM@>D<N@KPB@C8E
9<KKLE;<IJK8E;<@F>ÜFDGLK<1@<E:<@K>JG<:@8C@Q8KID8Ea<N@K@M<I8F;<@<F=K8C<8KDLCK@GC<
<FDG8E@8CJGIFM@>D<89@C8K8FIBN@K2KCLIK8C@M<I8FGLC8K8EaOG<I@<E=FD8:8;<D@>:IFLG
GIFA<K8J 7E<FE; DP<FDDLE:8K@K8F@CEI K8L>7E<M8CL89C<JFE@H8C89F18K8E@E@K@8E@CF@K8
DP JB@CBIFNC<:>8E: 8:8;<D@>K18@E8E8EFD<KFEKEI@9IK8PFLIFI>8E@Q8K@FEa

0FL D8P I<8? D<8KK?<4aD8@C;I<JJ /D<<KJ?8?ièrñu>D8@Ca:FD;8EK<C<G?FEkD9<I/èçaiÀaÀièÄ;äN@9C
?8GGIKFD8B<DPJ<C8M8@C89E8E@EK<IMK?<NIK?<@J:LJJP 98:B>IFLE;äHL8C@=@:8KOGFI@<8E;
@EK<I<JKJa
$$*(@)E: <I < CP \hat{a}$$

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ÜFM<#<KK<I

¢<8I)<:IL@K<Iâ

á 8D NI@K@P@Q<KQ<18LJ<F=DP JKIFE>@EK<I@E9K8@E@ECLK@*G<:@8C@GK@K@HH&<EKCPâ
8D <DGCFF>8J *F=KN8I@L8C@K@P8CPJ&K+I8EJ=@E;N?<I<á 8CJNFIBFE;<M<CFGD<EKN<C&LKFD8K@FE
JF=KN8I<â

á 8D @EK<I<J&K?@GJ@K@EELJ<â 8CN8PN8EK<K9<8;<M<CFGJ@E:á JK8IK<J@E:FDGLK<â=@E@K
<OKI<D<C@?@C8I8K@E=8K<FCLK@K&8KI<LJ<=L&B;M8E:<?LD8E@K@PFD<N8PââEK?<LII<EKK<:>EFCF>P
FI@<EKNFIC;â<@E8 *F=KN8I&E>@E<8E; (L8C@K@P8CPJ&â8M<8 GFN<I=L&G89@C@K&P<KFN8I;JK?<
<M<CFGD<EKN<C&J K<JK@FE<NJF=KN8I&K<@E89C<K&D8B<<M<B JD8C@DG8&K<J8 CFE>N8P8E; á 8JG@KF
9<G8I&=K?@NFLIE<@BEP=FIDá:8EâYCFââ 78M<9<<E@B *F=KN8I@L8C@K@P8CPJ&FIK?<G8J&<8IFI JFâ
+?IFL>?FLK?@â8M<J<<E8E; 9<<E8 G8I&=K?<M<CFGD<C&P<C<M<IPCFJ<CP&M<KKK?<<OK<E&F@E>
<M<CFGD<N&IBâ 78M<9<<ENFIB@B&E;<M<CFGD<B& 8LKFD8K@F&DK?<G8JKFLGC&=DFEK?Jâ

ÿJ PFL:8E J<<=IFDDP <E:CFJ<J<JLD<â 78M<I8;L8K<N@K&8JK<I;J;<I<<@F&DGLK<â: @<E:âIFD*K8K<
,E@M<IJ@E&P<N0FIBâY C98EP&P 8I<8F=JG<:@8C@Q&8&8F&â<E;âYIFEKâ<E;M<CFG@E>K<JK@E&8CJNFIB<;
8J 8E@EK<8&E=FID8K@FE?EFCF>8E; *<IM@:<âG8IKD<H&%<N0FIB *K8K&I@E&P D8JK<I;â8CJNFIB<;FE
8 I<J<8I:> GIFA<K&;<I>I8;L8K<GIF=<JJ&J 8 ;<M<CFG&â 8:8;<D@:NFIB<OG<I@<E&J GIFM@;D<N@KB@C&I
9<KK&E;<IJK8E;@E>ÜFDGLK<âI@<E:@K?@G<:@8C@Q&8&8F&â<N@K@M<I&F;@<F=K8C<E&DLCK@GC<
<FDG8E@8CJGIFM@;D<89@C@K&NFIBN@K&CKLI8C@M<I&FGLC8K&F&âOG<I@<E&FD8:8;<D@:>IFLG
GIFA<:K&J ?FE<; DP :FDDLE@:8K@B&@C&I K8L>?B<M8CL89C<JJFE@F&CC89FI8K&8FE@E@K@8&@C&E&M&8K
DP JB@CB&F&NC<;>8E; 8:8;<D@:KI8@E&C&E&F&D<K&FEKI@9I&K&P&FLIFI>8E@Q8K@F&â

0FL D8P I<8:> D<8KK?<âD8@C&;I<JJ /D<<KJ?8?îëñü>D8@Câ:FD}8EK<C<G?FE&D9<I/ëçèâiÂèâÂièÄ}â N@9C
78GG&K&D8B<DPJ<C&M8@C89&F&E@EK<IM&F&N&IK?<@J:LJJD 98:B>IFLE;âHL8C@=@:8K@G&EJ@<B&;
@EK<I<JKJâ

*@E:<I<CPâ

\$<<K*78?