## ! " #\$%&' (()% +, -. /, 01234%56 78.41-92:1,412:.;<=01-2129:<", /.123<#,4/2-.19->? @A%B%C'D'')CCD&' %%ECF' %

## ļļ

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

\$%. +/0!\$%%+1-&('%+!
! "##\$%&' (#)\*\$+, &-. /\*\$01+2\$
13"4"' &3\$+-(56))(-\*\$2', ((3\$(5\$13"4"' &3\$2'"64'6)\$
755"' 68\$2, -696: (-;\$
+, (468\$<=>?@

""#!\$ \$%. +/0!3+04+05. -/-'0/6\$%4+05. -/-'0/! +-6@-6\_H")";6)\$@\$+[]/\$SU?A\$`\$C!, 6-&:6H;"')\$aaa\$`\$a456';"(H)\$/")6&)6D\$ 1(@-6\_H")";6)\$`\$^(46\$ \$\$ """#!\$ \$%. +/0!70/)+-8'-%&!

\$\$1-I\$+-"4'": 36)\$(5\$: &;, (:, K)"(3(MK\*\$:, &-. &' (3(MK\*\$. 6J"'"4&3\$', 6. ");-K\*\$'3"4"' &3:, &-. &' (b"46;"')\$&4J\$

:, &-. &' (;, 6-&: K\$C"4'3HJ"4M\$#(;, \$: -6)'-":;"(4\$&4J\$4(4@.-6)'-":;"(4\$. 6J"'&;"(4)\$Z, 6-6\$&::3"'&#36D\$&)\$;, 6K\$&::3K\$

## +&;"64;\$Y))6)). 64;\$

E9&3H&;"(4\$(5\$: &;"64;\$5H4';"(4\$&4J\$JK)5H4';"(4\$;, -(HM, \$;, 6\$: 6-5(-. &4'6\$(5\$;6);)\$&4J\$&))6)). 64;)\$36&J"4M\$;(\$ (#F6';"96\$C6IMI\*\$:, K)"'&3\$&))6)). 64;\*\$, 6&3;, \$)'-664"4M"\$&4J\$3&#\$J&;&\$"4;6-:-6;&;"(4D\$&4J\$)H#F6';"96\$C: &;"64;\$ "4;6-9"6ZD\$J&;&\$". : (-;&4;\$;(\$;, 6\$:-(9")"(4\$(5\$'&-61\$

\$

<u>+, &-. &' (;, 6-&: K</u>\$

E9"J64'6#%%6J\$'3"4"'&3\$J6'")"(4\$. &b"4M"\$;,6-&:6H;"'\$;-6&;.64;\$:3&44"4M\*\$&4J\$.6J"'&;"(4\$;,6-&:K\$. &4&M6.64;\$);-&;6MK\$J6963(:.64;\$5(-\$:&;"64;)\$Z";,\$):6'"5"'\$J")6&)6}\$&4J\$'(4J";"(4)\$;,&;\$'(.:3"'&;6\$'&-6\$&4Jc(-\$:H;\$:&;"64;)\$&;\$,"M,\$-")b\$5(-\$

\$

 $\label{eq:hermitian} \begin{array}{l} & (H-)6\$' \left((-J''4\&;(-\$OEW7]E\$;, 6\$60\&. \$#6M''4)\&4J\$\right)H\#. \\ & (H-)6\$' \left((-J''4\&;(-\$OEW7]E\$;, 6\$60\&. \$#60W''4)\&4J\$\right)H\#. \\ & (H-)6\$' \left((-J''4\&;(-\$OEW7)E*I) + (H-)6\$'', 6$CW7, 1000 + (H-)6\$'', 1000 + (H-)6\$''', 1000 + (H-)61 + (H-)61 + (H-)61 + (H-)60 + (H-)61 + (H-)60 + ($ 

- \$\$
- 2;HJ64;)\$. H);\$H: 3(&J\$;, 6\$60&. \$"4\$&\$;". 63K\$5&), "(41\$\$W&"3H-6\$; (\$J(\$)(\$Z"33\$-6)H3;\$"4\$&\$d6-(\$(4\$;, &;\$60&. 1\$\$a4\$;;, 6\$6964;\$(5\$&4\$"4;6-46;\$"))H6\$;;HJ64;)\$Z, (\$, &96\$&4\$"))H6\$H: 3(&J"4M\$;, 6\$60&. \$Z"33\$'(4;&';\$;, 6\$'(H-)6\$'((-J"4&;(-)\$), ..., 6J"&;63K\$&4J\$;\$Z"33\$#6\$&JJ-6))6J\$&;\$;, 6\$J")'-6;"(4\$(5\$;, 6\$'((-J"4&;(-))\$
- \$\$
- <u>@()1!:0)'.+0!80+-%1!E-::!<0!E%+'1!AG!8%-&'/#!!</u>
- \$\$
- 2;HJ64;)\$Z"), "4M\$; (\$-69"6Z\$;, 6"-\$60&.)\$Z";, \$;, 6\$' (H-)6\$' ((-J"4&;(-)\$(-\$Z";, \$&\$): 6' "5"' \$36';H-6-\$. H);\$J(\$) (\$<#0+' !=!<&&\*(!(5\$Z, 64\$;, 6\$;6);\$)' (-6)\$&-6\$: ();6J\*\$(-\$<#0+' !>!<&&\*\$(5\$;, 6\$;". 6\$;, &;\$;, 6\$)' (-6\$5(-\$;, 6\$5"4&3\$60&.\$")\$: ();6J1\$</li>
- \$\$
- +-(#36.)\$(-\$"))H6)\$Z";, \$\_H6);"(40)D\$), (H3J\$#6\$"-);\$J"-6';6J\*\$9"&\$6@. &"3\*\$; (\$;, 6\$"4);-H';(-\$Z, (\$Z-(;6\$";1\$\$ !, 6\$" (H-)6\$'((-J"4&;(-C)D\$), (H3J\$#6\$'(:"6J\$(4\$;, ")\$6. &"3\*\$#H;\$";\$")\$;, 6\$-6): (4)"#"3";K\$(5\$;, 6\$"4);-H';(-\$; (\$ &JJ-6))\$;, 6\$'(4'6-4C)D1\$Ca5\$;, 6\$);HJ64;\$")\$H4)H-6\$Z, "', \$"4);-H';(-\$Z-(;6\$&\$): 6'"5"'\$\_H6);"(4\*\$;, 64\$, 6\$(-\$), 6\$. &K\$&)D\$;, 6\$'(H-)6\$'((-J"4&;(-ID\$!, 6\$);HJ64;\$")\$60: 6';6J\$;(\$"4'3HJ6\$-656-64'6)\$(-\$-&;"(4&36\$;(\$), 6\$: "5"'\$\_H6);"(4\*\$;, 64\$, 6\$(-\$), 6\$. &K\$&)D\$;, 6\$'(H-)6\$'((-J"4&;(-ID\$!, 6\$);HJ64;\$")\$60: 6';6J\$;(\$"4'3HJ6\$-656-64'6)\$(-\$-&;"(4&36\$;(\$), H:: (-;\$;, 6"-\$', &3364M63(H)6"4&3})\$-64. (6)11(1(6(6)4)3(\$6.)3(6).)3(,)G2-2(;)C)-1((;())(-2(;)C)-1(3(H1(\$))))

\$\$

- f4J6-M-&JH&;6\$. "J@;6-. \$M-&J6)\$Z"33\$#6\$: ();6J\$(4@"46\$5(-\$);HJ64;)\$;(\$9"6Z\$9"&\$O&446-I\$O"J@;6-. \$M-&J6)\$
   "4J"' &;6\$&\$);HJ64;g)\$);&;H)\$&;\$. "J@;6. 6);6-\$(43K\$&4J\$J(\$4(;\$"4J"' &;6\$;,6\$5"4&3\$:6-5(-. &4'6\$(H;'(. 6\$(5\$&\$);HJ64;)\$);HJ64;]\$
- \$\$
- <u>"&!%+10+!'%!<0!0:-F-<:0!\*%+!+0, 01-('-%&!('!'10!0&1!%\*!'10!/0, 0/'0+N!/'.10&'/!, ./'!)%, 8:R!E-'1!'10!STP</u>!
   \$; 3!M'.10&'!M.))0//!3%:-)R!'1+%. F1%. '!'10!/0, 0/'0+#!!!
- \$\$
- <u>M'. 10&'!M. ))0//!3%:-)R8</u> , ;;; )8ccZZZIH3. I6JHc: , &-. &'KcJ('H. 64;)c&J. "4c6&-3K"4;6-964;"(4&HMH);TUTT5"4&3I: J5\$
- \$\$
  - <u>U0, 01-('-%&!3%:-)R</u>&, ;;: &ccZZZIH3. I6JHc: , &-. &'KcJ('H. 64;)c(): &c-6. 6J"&;"(4: (3"'KI: J5</u>

!\$

\$

- "K#!\$ \$:(//!3%:-)-0/!(&1!3+%)01.+0/\$
  - Y;\$&\$. "4". H. \*\$&33\$: (3"'"6)\$);&;6J\$"4\$;,6\$'H--64;\$FNO\$''#\$%&'#!?/2+14!@)'\$)2!A!B3,)'+C)#+/')2!\$\$
  - D)'%5//\*\$), (H3J\$#6\$5(33(Z6J\$C)66\$<u>,;;:8ccZZZIH3.\_I6JHc);HJ64;:(3"'Kc</u>DI\$YJJ";"(4&3\$'3&))\$:(3"'"6)\$\$
- \$ \$ "4' 3HJ68\$
  - (#!\$ 00V'<%%\/!X+05.-+01Y2\$
    - >I\$\$ 1, "), (3. @OH-4)\$ O\*\$2', Z"4M, &. . 6-\$ ! N\*\$ \ 633)\$ OX\*\$ O&3(46\$ + O\*\$ I (36)&-\$ %O\*\$ /"+"- (\$%! \*\$6J)I\$\$?0)3. )1/#0&3)74E!!?3+' 1+72&(!)' %!?3)1#+1&I\$\$T4J\$6J\*\$^6Z\$L(-b\*\$ O'X-&Z@["33%4' I\*\$TU>UI\$%20^\$VB?UUB>RT>?UV\$
    - TI\$\$\$ O-H4; (4\$\N\*\$\&d(\$\2\*\$+&-b6-\$\ N\*\$6J)I\$F//%. )' !)' %!F+2. )' 6(H!I 0&!?0)3. )1/2/, +1)2! J) (+(! /:! I 0&3)7&\$#+1(H!

J''-6'; 3K\$Z'';, \$;, 6\$' (H-)6\$' ((-J''4&; (-'\$&)\$) ((4\$&)\$: ())"#361\$!, 6\$' (H-)6\$' ((-J''4&; (-\$. H);\$#6\$4(;"5"6J\$<u>8+-%+</u>\$; (\$&4\$60&. "4&;"(4\$"5\$&\$); HJ64;\$. "))6)\$&4\$60&. I\$!, 6\$fNO\$27+\$E0' H)6J\$Y#)64'6\$+(3"'K\$. H);\$ $#6$5(33(Z6J1$$+36&)6$-656-$; ($;, 6$(55"''&$J('H. 64;$5(-$J6;&"3)]$a4$'&)6$(5$6. 6-M64'K$;, 6$' (H-)6$' ((-J''4&; (-$. H);$#6$4(;"5"6J$<u>E-'1-&!Z[!1%.+/$</u>(5$;, 6$6. 6-M64'KI$$W&"3H-6$; ($J($)($Z"33$-6)H3;$"4$&$ d6-($CUD$M-&J6$5(-$;, &;$60&. I$$O&b6eH: $60&. $Z"33$#6$: -6: &-6J$&;$;, 6$)&. 6$(-$, "M, 6-$3696$;, &4$ ;, 6$(-"M''4&360&. I$$!, 6$5(-. &;, $$, $60&. I$$O&b6eH: $60&. $Z"33$#6$: -6: &-6J$&;$;, 6$)&. 6$(-$, "M, 6-$3696$;, &4$ ;, 6$(-"M''4&360&. I$$!, 6$5(-. &;, $$, $60&. I$$!, 6$6eH: $60&. $Z"33$#6$: -6: &-6J$&;$;, 6$)&. 6$(-$, "M, 6-$3696$;, &4$ ;, 6$(-"M''4&360&. I$$!, 6$5(-. &;, $$, $60&. I$$!, 6$0&. $$Z"33$#6$: -6: &-6J$&;$;, 6$)&. 6$(-$, "M, 6-$3696$;, &4$ ;, 6$(-"M''4&360&. I$$!, 6$5(-. &;, $$, $60&. I$$!, 6$0&. $$Z"33$#6$: -6: &-6J$&;$;, 6$)&. 6$(-$, "M, 6-$3696$;, &4$ ;, 6$(-"M''4&360&. I$$!, 6$(-"M''4&360&. I$$!, 6$(-"M''4&360&. I$$!, 6$(-"M''4&360&. I$$!, 6$(-"M''4&360&. I$$), (-;$&4)Z6-$"4);6&J$(5$. H3;": 36$', ("' 6$_H6);"(4)DI$$W&*3H-6$; ($&;;64J$ &$)', 6JH36J$. & &66H: $60&. $Z"33$=-6)H3;$"4$&&d6-($CUD$M-&J6$5(-$;, &;$&60&. $$$ 

<u>!</u>\$ 1#!\$

?)(10, -)!"&'0F+-'R2!!W&'H3;K\$&4J\$);HJ64;)\$.H);\$(#)6-96\$;,6\$fNO\$:H#3"),6J\$:(3"'K\$(4\$Y'&J6."'\$ /"),(46);K\$C)66\$+&M6\$S\$(5\$;,6\$fNO\$''#\$%&'#!?/2+14!@)'\$)2\$@\$ a5\$K (H\$&-6\$, &9"4M\$: - (#36.)\$Z";, \$6. (;"(4&3\*\$)('"&3\*\$&4Jc(-\$#6, &9"(-&3\$"))H6)\$: 36&)6\$'&33\$&4K\$(5\$;, 6\$ . 64;&3\$, 6&3;, \$'3"4"')\$(4\$;, 6\$FNO\$'&. : H)\$; (\$. &b6\$&4\$&: : ("4;. 64;I\$Y33\$)6-9"'6)\$&-6\$5-66\$; (\$FNO\$);HJ64;)\*\$);&55\*\$&4J\$&-6\$; (\$FNO\$);-"';3K\$' (45"J64;"&31\$

- 17+\$755"'6\$(5\$2;HJ64;\$&4J\$+-(56))"(4&3\$Y55&"-)8\$=ST@=?UU\$
- fNO\$1(H4)63"4M\$164;6-8\$=ST@ATTU\$
- O&--"&M6\$&4J\$W&. "3K\$!, 6-&: K\$13"4"' &=ST@ARB?\$
- 1(. . H4";K\$1(H4)63"4M\$164;6-8\$=ST@>TR=\$
- fNO\$[EN+2\$C[63: "4M\$EJH'&;(-)\$&4J\$N6&-46-)\$+-6964;\$2H"'"J6D\$+-(F6';\$755"'68\$=ST@>==A\$
- !, 6\$f4"96-)";K\$(5\$N(H")"&4&\$&;\$O(4-(6\$);-"96)\$;(\$)6-96\$);HJ64;)\$Z";,\$):6'"&3\$466J)\$;,-(HM,\$
- '(.:3"&4'6\$Z";,\$26';"(4)\$AUS\$(5\$;,6\$]6,&#"3";&;"(4\$Y';\$(5\$>VB=\$&4J\$;,6\$Y.6-"'&4)\$Z";,\$

 $\begin{array}{l} 0+'-^{*}-)('-\%\&!+05..+0, \ 0\&'/!(+0!/.<=0)'!'\%!)I(\&FO\#!!?:'I\%.FI!STP!3+\%F+(, !7-+0)'\%+/!(\&\&.(::R!+0)-0E!(\&1!.81('0!:-)0\&/.+0!-\&^{*}\%+, ('-\%\&!^{*}\%+!0>0+R!/'('0N!'I0!^{*}().:'R!+0)\%, , 0\&1/!'I('!<0^{*}\%+0!-0\&+\%::-\&FI-\&!(!8+\%F+(, !(\&1!'I+\%.FI\%.'!0&+\%::, 0\&'N!/'.10&'/!)\%, , .&-)('0!E-'I!'I0!(88:-)(<:0!-/'('0!<\%(+1!'\%!))\%&^{*}+, !.&10+/'(&1-&F!(&1!EI0'I0+!.8\%\&!)\%, 8:0'-\%\&!\%^{*}!STP^{/}!8+\%F+(, N!'I0R!-E-::!, 00'!+05..+0, 0&'/# \end{array}$ 

K#!\$	\$%. +/0!M) I 01. :02\$		
	₽%&1(R!(&1!_01&0/1(R!A]2]]4AA2\]\$		
	!\$		
T0)'.	+0!`\$!7('0\$! 0-':0\$!	C().:'R\$!	3%-&'/!
			%&!
			OV(, \$!

TT\$		+Y[\$:,&&'(3(MK\$	N"H\$	R\$\$	\$\$	\$\$
T=\$	>UcV\$\$	+Y[\$;,6-&:6H;"')\$	1(. 6&H\$	R\$\$	\$\$	\$\$
		\$				
TS\$		Xa\$: &; , (\$\$	N"H\$\$	R\$\$	\$\$	\$\$

Z [\$		6-&: 6H;"')\$(5\$'", ()")*\$, 6: &;"'\$5&"3H-6*\$&4J\$J-HM\$  H'6J\$; (Q"'";K\$\$\$\$	1(. 6&H\$	R\$	\$\$	\$
\$!	>>cTB\$\$ ![\	Y^I 2Xaqa^X\$[ 7Na/YL\$\$	\$			