# JC>I:9 HI6I:H

H: 8JG>I>: H 6C9 : M8 = 6C <: 8DBB>HH>DC

 $L QcXY^Wd_^' 9)8) -+0/4$ 

;DGB ,+(F

**\$BQb[ D^**U%

FJ6GI:GANG:EDGIEJGHJ6CIIDH:81>DC,.DG,0F

IG6CH>I>DC G:EDGI EJGHJ6C1 ID H: 8 I>DC ,. DG ,08T% D; I=: H:8 JG>I>: H: M8=6C<: 68 I D; ,4./

# C: LH 8DGEDG6 I>DC

9UQgQbU /1(-40+42+

<u>IVd\U\_V UQ\$X \$\Qcc</u>

9^See 7 9a\_\_a` IfaU]' bSd hS^gW !+)+, bWd eZ\$dW

9^See 8 9a\_\_a` IfaU]' bSd hS^gW !+)+, bWd eZ\$dW

I bQTY^W Hi ] R\_\\$c\ DM I 7 DM I CQ]U\_VUQSX UhSXQ^WU \_^ gX\SX bUWYcdUbUT JZW DSeVSc =^aTS^ IW^WUf CSd]Wf JZW DSeVSc =^aTS^ IW^WUf CSd]Wf

#### C: LH 8DGEDG6 I>DC

;DGB ,+(F I67A: D; 8DCI:CIH

 $9a^ea^[VSfWV \ IfSfW_W\ e \ Xad \ fZWD \ W \ - 9 \ a \ [ \ a \ W \ e \ W \ ]$ 

# E6GI >

# >I:B,);>C6C8>6AHI6I:B:CIH

# C: LH 8DGEDG6 I>DC

# 8DCHDA>961:9 H161:B:CIHD; DE:G61>DCH

 $K^\S V[fWV6_[^n[a]e'WjUWbfbWdeZSdWS_ag^fe%]$ 

	_	;_b dXU dXbUU ] HU`dU] R	
	C_dUc	-+-,	-+-+
HWhW`gWe5			
9[dUg^Sf[a`S`V egTeUd[bf[a`		! ,'+22	! ,'++-
7 VhWdf[e[`Y		/+0	
9a`eg_Wd		0-/	//,
HWS^ WefSfW		+	0
EfZWd	_	,21	,+2
J afS^ HWhW`gWe		- '0+-	-',,2
EbWdSf[`Y WjbW`eWe		\$,'-/%	\$,',1/%
IW^^[`Y' YW`WdS^ S`V SV_[`[efdSf[hW		\$3/3%	\$130%
: $WbdWU[Sf[a`S`VS_adf[1Sf[a`$		\$,10%	\$,1/%
?_bS[d_W`f S`V dWefdgUfgd[`Y UZSdYWe	/	\$%	\$/+%
; cg[fk ^aeeWe aX SXX[^[SfWe	0	p	\$,%
?`fWdWef WjbW`eW'`Wf		\$%	\$3%
EfZWd'`Wf	, .	, . 2	,2
?`Ua_W TWXadW [`Ua_W fSj WjbW`eW	_	3	2-
?`Ua_WfSj WjbW`eW	, ,	\$2,%	\$ <b>-</b> O%
DWf[`Ua_W	_	-12	/2
BWee5 DWf [`Ua_W Sffd[TgfST^W fa `a`Ua`fda^^[`Y [`fWdWefe		\$2,%	\$,.%
DWf [`Ua_W Sffd[TgfST^W fa DWie 9adbadSf[a` efaU]Za^VWde		,41	! ./
$D \texttt{Wf} \ [\texttt{`Ua\_W Sffd} \ [\texttt{TgfST^W fa DW ie 9 adbadSf[a`efaU] Za^VWde bWd eZSdW'TSe[U S`V V[^gfWV]] } ]$	4	+)	! +)+1

 $\label{lem:continuous} JZW\ SUUa\_bS`k[`Y\ `afWe\ SdW\ S`\ [`fWYdS^bSdf\ aX\ fZWeW\ g`SgV[fWV\ Ua`ea^[VSfWV\ X[`S`U[S^efSfW\_W`fe)]] \\$ 

-

# C: LH 8DGEDG6 I>DC

# 

;\_b dXU dXbUU ]\_^dXc U^TUT HU^dU] RUb .+'

		-+-,	-+-+
DWf [`Ua_W	!	-12 !	/2
$ EfZWd Ua\_bdWZW e[hW ^aee% [`Ua\_W5] $			
<adw[y`ugddw`uk fds`e^sf[a`sv\gef_w`fe<="" td=""><td></td><td>\$,1/%</td><td>,+2</td></adw[y`ugddw`uk>		\$,1/%	,+2
DWf UZS`YW [`fZW XS[d hS^gW aX USeZ X^a i ZWVYWe <sup>\$S\$</sup>		,	\$ - %
8 W`WX[f b^S` SV\gef_W`fe' `Wf <sup>\$T%</sup>		0	3
EfZWd Ua_bdWZW`e[hW \$^aee% [`Ua_W		\$,03%	,,.
9 a _ bdWZW`e[hW [`Ua _W		,+4	, 1+

#### C: LH 8DGEDG6 I>DC

# 8DCHDA>96I:9 HI6I:B:CIHD; 86H=;ADLH

\$K`SgV[fWV6 \_[^^[a`e%

;\_b dXU dXbUU ]\_^dXc U^TUT HU`dU] RUb .+' DafWe -+-+ D`UbQdY^W QSdYfYdYUc5 DWf[\Ua\_W -12! /2 7 V\gef\_W\fe fa dWUa\U[^W\Wf[\Ua\_W\fa\Wf USeZ\bdah[VWV\Tk\abWdSf[\Y\SUf[h[f[We5] , 10 : WbdWU[Sf[a`S`VS adf[1Sf[a` ,1/ EbWdSf[`Y ^WSeW WjbW`eW 0 ; cg[fk \aee\e a\left SXX[\sigma[Sf\e]e p 9SeZ V[efd[Tgf[a\e dWUW[hWV Xda SXX[^[SfWe EfZWd' `Wf \$,.2% \$,2% : WXWddWV [`Ua\_W fSjWe S`V fSjWe bSkST^W -2 ,+ 9ZS`YW[`abWdSf[`Y SeeWfe S`V \[ST[\[f[We'\Wf aX SUcg[e[f[a\e5] HWUWIhST^We S`V afZWd SeeWfe 4 \$/1% ?`hW`fad[We'`Wf \$04% 7UUag`fe bSkST^W S`V afZWd ^[ST[^[f[We \$/-% \$-/+% 13 DWf USeZ bdah[VWV Tk abWdSf[`Y SUf[h[f[We ,00, >^fUcdY^W QSdYfYdYUc5 9Sb[fS^WibW`V[fgdWe \$,+,% \$4.% 7Ucg[e[f[a]e'] Wf aX USeZ SUcg[dWV \$,% p ?`hWef W`fe [` Wcg[fk SXX[^[SfWe S`V afZWd \$2% \$,1% FdaUWWVe Xda\_ bdabWdfk' b^S`f S`V Wcg[b\_W`f S`V afZWd SeeWf V[ebae[f[a`e \$-% EfZWd' `Wf -/ DWf USeZ geWV [ hWef[ Y SUf[h[f[We \$40% \$41% ; Y^Q^SY^W QSdYfYdYUc5 1 8 adda i [`Ye .23 , - . HWbSk W`f aX Tadda i [`Ye 1 \$.3.% \$,,4% : [h[VW\ Ve bS[V \$-2% \$-+% EfZWd'`Wf \$0.% \$./% DWf USeZ geWV [ X[ S U[ Y SUf[h[f]We \$30% \$0+% DWf UZS`YW [` USeZ S`V USeZ Wcg[hS^W`fe 4 \$,,-% -'-.1 9SeZ S`V USeZ Wcg[hS^W`fe' TWY[``[`Y aX bWd[aV ,'0,2; jUZS`YW \_ahW\_W`f a` abW`[`Y USeZ TS^S`UW \$-/% -',++ , '0.49SeZ S'V USeZ Wcg[hS^W fe' W V ax bWd[aV

# CDI: ,) 9:H8G>EI>DCD; 7JH>C:HH 6C9 76H>HD; EG:H:CI6I>DC

# +>0F0 KC 8NB0BJP>PFKJ

# **CDI:** -) **G:K:CJ:**H

 $JZW\ Xa^\wedge a\ i\ [\ Y\ fST^We\ bdWeW\ f\ fZW\ 9\ a\_bS\ kse\ V[eSYYdWYSfWV\ dWhW\ gWe\ Tk\ fkbW\ S\ V\ eWY\_W\ f\ Xad\ fZW\ fZdWW\ \_a\ fZe\ W\ VWV ]$ I WbfW\_TWd .+' -+-, S`V -+-+5

;\_b dXU dXbUU ]\_^dXc U^TUT HU`dU ] RUb .+' -+-,

CUgc BUTYQ

I\_dQ\ GUfU^eUc  $\mathbf{D}d\mathbf{X}\mathbf{U}\mathbf{b}$ 

#### DdXUb bUfU^eU TYcS\\_cebUc

#### : TWYLFLJ 1MTNHJ

?` @g`W -+-,'H;  $7 = dagb SUcg[dWV C adfYSYW 9Za[UW B[_[fWV $q C adfYSYW 9Za[UWr% Xad Sbbdaj[_SfW^k 7!-//_[^[a`[`USeZ $Sbbdaj[_SfW^k!,3.__[^[a`TSeWV a` WjUZS`YW dSfWe Se aX fZW U^ae[`Y VSfW%' Xg`VWV TK S`[`UdWSeW [`H; <math>7 = dagbse VWTf XSU[^[f[We) 9a`fda^i Se fdS`eXWddWV S`V fZW SUcg[e[f[a`TWUS_W WXXWUf[hW S`V T[`V[`Y a` C adfYSYW 9Za[UW eZSdWZa^VWde a`@g`W,3'-+-, gba` Uagdf SbbdahS^) C adfYSYW 9Za[UW [e S ^WSV[`Y 7 gefdS^[S`_adfYSYW Tda][`Y Tge[`Wee' S`V fZW SUcg[e[f[a` Ua_b^w_W`fe H; <math>7 = dagbse Wj[ef[`Y I_Sdf^[`W Tda]]Wd Xaafbd[`f S`V SUUW^WdSfWe H; <math>7 = dagbse X[`S`U[S^eWdh[UWe efdSfWYk fa WefST^[eZ S ^WSV[`Y _adfYSYW Tda][`Y Tge[`Wee i [fZ `Sf[a`S^eUS^W) C adfYSYW 9Za[UW [e S egTe[V[Sdk aX H; <math>7 = dagbse X[S^eVV] Y = dagbse X[S^eVV$ 

 $JZW \ bgdUZSeW \ bd[UW \ S^auSf[a`ZSe \ TWW` \ bdWbSdWV \ a`S \ bdW^{-}_{S'W} \ SeWf \ S`V \ UZS`YWe \ fa \ fZW \ bdW^{-}_{S'W} \ bdW^{-}_{S'W} \ bdUZSeW \ bd[UW \ S^auSf[a`e\_Sk \ aUUgd \ Se \ SVV[f[a`S^{-}_Xad\_Sf[a` \ Ua`UWd`[`Y \ SeeWf \ S`V \ ST^{-}_{ST}['fk \ hS^gSf[a`e \ e \ K] \ S^{-}_{S'W} \ O' \ 7 \ SeWf \ aX \ fZW \ SUcg[e[f[a`'fZW \ 9 \ a\_bS`k \ dWUadVWV`Wf \ fS`Y[T^W \ SeeWfe \ aX \ 7 \ !11 \ _[^a[a` \ KI \ !0+ \ _[^a[a` \ Ua`e[ef[`Y \ bd[\_Sd[^k \ aX \ Ua\_\_[ee[a` \ Ua`fdSUf \ dWUW[hST^We \ S`V \ Sbbdaj[\_SfW^k \ 7 \ !2/ \ _[^a[a` \ KI \ !01 \ _[^a[a` \ aX \ VW`f[X]ST^W \ [`fS`Y[T^W \ SeeWfe' \ Ua`e[ef[`Y \ aX \ 7 \ !/1 \ _[^a[a` \ KI \ !.0 \ _[a` \ KI \ !.0 \ _[^a[a` \ KI \ !.0 \ ]]$ 

### /LWJJRJSYYTFHVZNWJ<=70

?` @g^k -+- ,' fZW 9a\_bS`k W`fWdWV [`fa S` SYdWW\_W`f fa SUcg[dW fZW E[^ Fd[UW ?`Xad\_Sf[a` IWdh[UW Tge[`Wee S`V dW^SfWV SeeWfe \$qEF?Ir\ Xda\_ I #F =^aTS^?`U) \$qI #Fr\ S`V ?>I CSd][f BfV) \$q?>Ir\ Xad !,), 0 T[^[a` [` USeZ' egT\WUf fa Ugefa\_Sdk bgdUZSeW bd[UW SV\gef\_W`fe) EF?I [e S Y^aTS^ [` Vgefdk efS` VSdV Xad TW`UZ\_Sd] S`V dWXWdW`UW bd[U[`Y S`V `W i e S`V S`S^kf[Ue Xad fZW a[^' `SfgdS^ YSe ^[cg[Ve S`V T[aXgW^e [` Vgefd[We) JZW Tge[` Wee S^ea bdah[VWe bd[U[`Y S`V `W i e S`V S`S^kf[Ue Xad fZW UaS^' \_[` [` Y S`V \_WfS^e W`V \_Sd] Wfe S`V [` e[YZfe S`V S`S^kf[Ue [` dW`W i ST^We S`V USdTa` bd[U[`Y) EF?I i [^^ TW S egTe[V[Sdk aX : a i @a`We' S`V [fe dWeg^fe i [^^ TW [` U^gVWV [` fZW : a i @a`We eWY\_W`f) JZW SUcg[e[f[a` [e egT\WUf fa Ugefa\_Sdk U^ae[`Y Ua`V[f[a`e' [` U^gV[`Y dWYg^Sfadk SbbdahS^e S`V fZW Ua`eg\_\_Sf[a` aX fZW I #F S`V ?>I \_WdYWd' S`V [e Wj bWUfWV fa U^aeW [` fZW eWUa`V ZS^X aX X[eUS^-+--)

# CDI: 0) > CK: HIB: CIH

			EUl	D g ^UbcXY` oSU^dQWU Qc _V U ] RUb .+' -+-,		6 c _V RUb .+' -+- ,		óc_V .+' -+-,
						\$\\^ ] \\	\Y_^c%	
;cg[fk _WfZaV[`hWef_W`fe <sup>\$S%</sup>				hSd[age	!	-,,	!	2,
;cg[fk eWUgd[f[We <sup>\$T%</sup>				hSd[age		-33		-3+
JafS^?`hWef_W`fe	[	f	<b>‰</b> ‰	Z E	!	/44	!‰	.0,
\$\$\\ : gd[`Y fZ\\ fZ\\\ a`fZ\\	W VWV IWB#W	C	9a bS‰	w v				

# C: LH 8DGEDG6I>DC CDI:HIDI=: JC6J9>I:9 8DCHDA>96I:9;>C6C8>6A HI6I:B:CIH

# CDI: 1) 7DGGDL>C<H

JZW 9a\_bS`kse fafS^ Tadda i [`Ye Ua`e[ef aX fZW Xa^^a i [`Y5

	>^dUbUcd bQdU Qd HU`dU]RUb.+' -+-,	B QdebYdi Qd HU`dU] RUb.+' -+-,	6 c _V HU`dU ] RUb .+' -+- ,	6c_V ?e^U .+' -+-,
			\$Y^ ] Y\\Y_	
CUgc 8 b b bQdV ^				
-+-, IW`[ad`afWe	.)320 "	CSk ,0' -+-4	! 431	! 430
; hdU\ <b \="" \<="" e="" td=""><td></td><td></td><td></td><td></td></b>				
$-+,4$ 9dWV[f XSU[^[fk $^{ST\%}$	-) "	CSk .,' -+-/	-,3	
-+,4 JWd_ ^aS` XSU[^[fk	1)-0 "	Dah' -+-/	,3,	,4+
$-+, 2 \text{ Mad}][Y \text{ USb[fS}^{\Lambda} \text{ XSU[}^{\text{ffk}}]]$	-) "	CSk .,' -+-/	p	p
J W^efdS <su[^[fk< td=""><td>2)3- "</td><td>: WU' -+-2</td><td>13</td><td>1+</td></su[^[fk<>	2)3- "	: WU' -+-2	13	1+
-+,- KI bd[hSfW b^SUW_W`f	/)-2 "	@g^ -0' -+	,44	-+-
-+,- KI bd[hSfW b^SUW_W`f	/)/- "	@g^ -0' -+-/	,0+	,0-
-+,- $KI$ $bd[hSfW b^SUW_W^f p 7K: badf[a^$	2)+/ "	$@g^{\wedge} -0' -+$	2/	23
$\underline{G:6} < \underline{b} \underline{e}^{\underbrace{50\%}}$				
-+-, 8d[VYW XSU[^ffk	р "	$@g^{\wedge}$ . , $'$ -+	p	.,/
-+ 9dWV[f XSU[^[fk p fdS`UZW , \$V%	,)+1 "	IWb ,1' -+-/	-4+	p
-+ $9 \text{dWV}[f \text{XSU}[^f] \text{fk } p \text{ fdS}^UZW -^{SV}]$	,)-, "	I Wb ,1' -+-0	4	p
; Y^Q^SU \UQcU Q^T dXUb \YQRY\YdYUc			34	,++
JafS^ Tadda i [`Ye			-'-1/	-'.,.
BWee5 UgddW`f badf[a`\$\\\			\$.++%	\$-3%
Ba`Y(fWd_ Tadda i [`Ye			! ,'41/	! -'-30

- JZWeW Tadda i [`Ye i WdW [`UgddWV Tk UWdfS[` egTe[V[Sd[We aX DN; 7 gefdS^[S Ffk B[\_[fWV \$fZW q<ajfW^ =dagbr S`V faYWfZWd i [fZ egUZ egTe[V[Sd[We' fZW q<ajfW^ : WTf =dagbr% S`V H; 7 =dagb S`V UWdfS[` aX [fe egTe[V[Sd[We \$H; 7 =dagb S`V UWdfS[` aX [fe egTe[V[Sd[We fZW qH; 7 : WTf =dagbr%' Ua`ea^[VSfWV Tgf`a` i Za^^k(ai`WV egTe[V[Sd[We aX DW i e 9 adb' S`V SdW a`^k YgSdS`fWWV Tk fZW <ajfW^ =dagb S`V H; 7 =dagb S`V fZW[d dWebWUf[hW egTe[V[Sd[We' Se Sbb^[UST^W' S`V SdW`a`(dWUagdeW fa DW i e 9 adb)
- \$U\\ JZ\W USddk[`Y hS^g\We a\X fZ\W Tadda i [`Ye [`U^g\V\W S`k \XS[d hS^g\W SV\gef\_\W`fe d\W^S\f\\V fa fZ\W 9 a\_bS`kse \XS[d hS^g\W Z\W\Y\\We) I\\W\\ Daf\W 3 p <[`S`U[S^?`efdg \W`fe S`V <S[d LS^g\W C\\WSegd\W \\W`fe)
- \$V% 7e aX IWbfW\_TWd .+' -+- ,' H; 7 = dagb ZSV fafS^ g`VdS i` Ua\_\_[f\_W`fe aX 7!,32 \_[^[a` ShS[^ST^W g`VWd fZW -+-- 9dWV[f <SU[^[fk \$Se VWX[`WV TW^a i %)]
- $\label{eq:continuous} $$ JZW 9a_bS^k U^See[X[We fZW UgddW^f badf[a^aX^a^Y fWd_VWTf Se^a^(UgddW^f^ST[^f[We a^fZW 8S^S^UW IZWWfe i ZW^f fZSe fZW [^fW^f S^V ST[^f[k fa dWX[^S^UW fZW aT^f]YSf[a^a^S^a^Y(fWd_TSe[e'[^SUUadVS^UW i [fZ 7 I 9 /2+(0+q:WTf)r !-2 _ [^n[a^S^V !-3 _ [^n[a^dW^SfWe fa fZW UgddW^f badf[a^aX X[^S^UW ^WSeW ^[ST[^f[We Se aX IWbfW_TWd .+'-+-, S^V @g^W .+'-+-, 'dWebWUf[hW^k)] $$ dw^SfWe fa fZW UgddW^f badf[a^aX X[^S^UW ^WSeW ^[ST[^f[We Se aX IWbfW_TWd .+'-+-, S^V @g^W .+'-+-, 'dWebWUf[hW^k]) $$ dw^SfWe fa fZW UgddW^f badf[a^aX X[^S^UW ^WSeW ^f[ST[^f[We Se aX IWbfW_TWd .+'-+-, S^V @g^W .+'-+-, 'dWebWUf[hW^k]) $$ dw^SfWe fa fZW UgddW^f badf[a^aX X[^S^UW ^WSeW ^f[ST[^f[We Se aX IWbfW_TWd .+'-+-, S^V @g^W .+'-+-] $$ dw^SfWe fa fZW UgddW^f badf[a^aX X[^S^UW ^WSeW ^f[ST[^h]f[We Se aX IWbfW_TWd .+'-+-] $$ dw^SfWe fa fZW UgddW^f badf[a^aX X[^S^UW ^WSeW ^f[ST[^h]f[We Se aX IWbfW_TWd .+'-+-] $$ dw^SfWe fa fZW UgddW^f badf[a^aX X[^S^UW ^WSeW ^f[ST[^h]f[We Se aX IWbfW_TWd .+'-+-] $$ dw^SfWe fa fZW UgddW^f badf[a^aX X[^S^UW ^WSeW ^f[ST[^h]f[We Se aX IWbfW_TWd .+'-+-] $$ dw^SfWe fa fZW UgddW^f fa fZ$

#### 9. \* ONKQL 9BCFJ>J@FJD

 $= dagb _Sk \ dWcgWef [`UdWSeWe [` fZW S_ag`f aX fZW -+-- 9dWV[f < SU[^{fk} gb fa S_Sj[_g_ S_ag`f aX 7 ! 0++ _[^{a`'} egT\WUf fa fZW fWd e S`V ^[ [fSf]a`e eWf XadfZ [` fZW ek`V[USfWV XSU]^{fk} SYdWW W`f)$ 

 $8 \ adda \ i \ [`Ye g`VWd fZW -+-- 9 dWV[f XSU[^fk p fdS`UZW , SUUdgW [`fWdWef Sf S dSfW aX fZW 7 gefdS^[S` 8 8 IO b^ge S \_SdY[` aX TWf i WW` ,)++ " S`V -),+ "' VWbW`V[`Y a` H; 7 = dagbse `Wf ^WhWdSYW dSf[a) 8 adda i [`Ye g`VWd fZW -+-- 9 dWV[f XSU[^fk p fdS`UZW - SUUdgW [`fWdWef Sf S dSfW aX fZW 7 gefdS^[S` 8 8 IO b^ge S \_SdY[` aX TWf i WW` ,),0 " S`V -)-0 "' VWbW`V[`Y a` H; 7 = dagbse `Wf ^WhWdSYW dSf[a) 8 afZ fdS`UZWe USddk S Ua \_ _ [f _ W`f XWW aX /+ " aX fZW Sbb^[UST^W _SdY[` a` S`k g`VdS i` TS^S`UW)$ 

 $JZW -+-- 9 dWV[f < SU[^fk dWcg[dWe H; 7 = dagb fa _S[^fS[^ $[\% S `Wf ^WhWdSYW dSf[a aX `af _adW fZS` .)0 fa ,)+ S`V $[[\% S `[^fWdWef UahWdSYW dSf[a aX `af ^Wee fZS` .)+ fa ,)+) JZW ek `V[USfWV XSU[^fk SYdWW_W `f S^ea Ua `fS[^e UWdfS[^ afZWd Ugefa_Sdk SXX[d_Sf[hW S`V `WYSf[hW UahW`S `fe) IgT\WUf fa UWdfS[^ Wj UWbf[a `e' fZWeW UahW`S `fe dWefd[Uf ad bdaZ[T[f H; 7 = dagb S`V [fe egTe[V[Sd[We Xda_' S_a `Y afZWd fZ[^Ye' [^ Ugdd[^Y ad YgSdS `fWW[^Y VWTf' V[ebae[^Y aX UWdfS[^ bdabWdf[We ad SeeWfe' _WdY[^Y ad Ua^ea^[VSf[^Y i [fZ S`k afZWd bWdea^' -S][^Y X[^S U[S^ SUUa_aVSf[a` ShS[^ST^W' W` fWd[^Y [^fa UWdfS[^ afZWd X[^S U[^Y SddS `YW_W `fe' UdWSf[^Y ad bwd_[ff[^Y UWdfS[^ AfWe' g` VWdYa[^Y Xg`VS_W `fS^ Tge[^Wee UZS `YWe S`V_S][^Y dWefd[UfWV bSk_W `fe)$ 

#### , KRBJ>JP0

 $JZW 9a\_bS`kse Tadda i [`Ye S`V fZaeW aX [fe Ua`ea^[VSfWV egTe[V[Sd[We Ua`fS[` Ugefa\_Sdk dWbdWeW`fSf[a`e' UahW`S`fe S`V WhW`fe aX VWXSg^f' [`U^gV[`Y fZaeW V[eUgeeWV STahW S`V [` fZW 9a\_bS`kse -+-, <ad__, +(A) ?X S`k aX fZW WhW`fe aX VWXSg^f aUUgd S`V SdW `af UgdWV i [fZ[` Sbb^[UST^W YdSUW bWd[aVe ad i S[hWV' S`k g`bS[V S_ag`fe g`VWd fZW Sbb^[UST^W VWTf SYdWW_W`fe _Sk TW VWU^SdWV [__WV[SfW^k VgW S`V bSkST^W) JZW 9a_bS`k i Se [` Ua_b^[S`UW i [fZ S^^ egUZ UahW`S`fe Sf IWbfW_TWd .+' -+-,)$ 

#### CDI: 2): FJ>IN

JZW Xa^a i Y fST^We eg \_ \_Sd[IW UZS YWe [ Wcg[fk Xad fZW fZdWW \_a fzw VWV IWbfW\_TWd .+' -+- , S V -+-+5

					;_b dXU dXbUU	] _^dXc U^TUT HU	`dU ] RUb .+' -+-,			
		8_]]_^ _S[		8_]]_^ _S[	6TT\\d\\_^Q\ EQ\\T(\\^	6SSe ] e\OdUT	6SSe ] e\QdUT DdXUb 8_ ] `bUXU^cYfU	I_dQ\ CUgc 8_b`	C_^( S_^db_\\Y^W	I dO/
	HXQbUc	6]_e^d	HXQbUc	6]_e^d	8Q'YdQ\	9 UVISYd \$Y^ 1 Y\\Y_^c%	A_cc	: ae\di	>^dUbUcdc	I_dQ\ ∶aeYdi
8S^S`UW'@g`W .+' -+-,	.4,	! /	-++	! -	!,-'+02	! \$-'4,,%	! \$4/,%	! 3'-,,	! 4.0	! 4',/1
DWf[`Ua_W	p	p	p	p	p	,41	p	,41	2,	-12
EfZWd Ua_bdWZW`e[hW ^aee	p	p	p	p	p	p	\$,-+%	\$,-+%	\$.3%	\$,03%
: [h[VW`Ve	p	p	p	p	\$04%	p	p	\$04%	\$-2%	\$31%
EfZWd	_	р	р	р	\$,3%	р	р	\$,3%	\$.%	

# Hd\_S[GU`ebSXQcUc

 $E`IWbfW_TWd_{--'-+-,'}fZW_{9a_bS^k}S^*ag^UWV_{S^Wi}_{efaU}_{dWbgdUZSeW}_{bdaYdS_SgfZad[1[Y_fZW_{9a_bS^k}fa_bgdUZSeW}_{gb_fa_bS^k}_{efaU}_{e$ 

# C: LH 8DGEDG6I>DC CDI:HIDI=: JC6J9>I:9 8DCHDA>96I:9;>C6C8>6A HI6I:B:CIH

JZW Xa^a i [`Y fST^W eg \_ \_Sd[1We fZaeW SeeWfe S`V ^[ST[^[f[We \_WSegdWV Sf XS[d hS^gW a` S dWUgdd[`Y TSe[e5

		(	6c _V	HU`dU]	RUb	.+' -+-	٠,				6 c	_V ?e^	U .+'	-+-,		
	A	U <b>f</b> U∖,	AU	JfU∖ -	AU	fU∖.	I	_dQ\	Al	IJ <b>fU∖</b> ,	AU	fU∖ -	Αl	fU∖.	I	_dQ\
								\$Y^ ] Y	\\Y_^	c%						
6 ccUde5																
9daee(UgddW`Uk [`fWdWef dSfW VWd[hSf[hWe ( XS[d hS^gW ZWVYWe	!	p	!	,4	!	p	!	,4	!	p	!	,3	!	p	!	,3
9daee(UgddW`Uk [`fWdWef dSfW VWd[hSf[hWe		p		22		p		22		p		2.		p		2.
;cg[fk eWUgd[f[We <sup>\$S%</sup>		,43		p		4+		-33		,1/		p		, , 1		-3+
I_dQ\ QccUdc	!	,43	!	41	!	4+	!	.3/	!	,1/	!	4,	!	, , 1	!	.2,
AYQRY\YdYUc5																
?`fWdWef dSfW VWd[hSf[hWe ( USeZ X^a i ZWVYWe	!	p	!	2	!	p	!	2	!	p	!	4	!	p	!	4
9daee(UgddW`Uk [`fWdWef dSfW VWd[hSf[hWe		p		, ,		p		, ,		p		, .		p		, .
I_dQ\ \YQRY\YdYUc	!	р	!	,3	!	р	!	,3	!	р	!		!	р	!	

\$S% I WW DafW O p ?`hWef\_W`fe)

 $: gd[`Y fZW fZdWW \_a`fZe W`VWV IWbfW\_TWd .+' -+-,' fZW 9a\_bS`k dWU^See[X[WV [fe [`hWef\_W`f [`S`Wcg[fk eWUgd[fk Xda\_BWhW^ . fa BWhW^ , i [fZ]` fZW XS[d hS^gW Z[WdSdUZk Se fZW [`hWef_W`f TWUS_W bgT^[U^k fdSVWV [`fZW XS[d hS^gW Z[WdSdUZk Se fZW [`hWef_W`f TWUS_W bgT^[U^k fdSVWV [`fZW X]def cgSdfWd aX X[eUS^ -+--)$ 

#### : aeYdi cUSebYdYUc

JZW XS[d hS^gWe aX Wcg[fk eWUgd[f[We i [fZ cgafWV bd[UWe [` SUf[hW \_Sd] Wfe SdW VWfWd\_[`WV TSeWV a` fZW U^ae[`Y bd[UW Sf fZW W`V aX WSUZ dWbadf[`Y bwd[aV) JZWeW eWUgd[f[We SdW U^See[X[WV Se BWhW^, [` fZW XS[d hS^gW Z[WdSdUZk agf^[`WV STahW) JZW XS[d hS^gW aX Wcg[fk eWUgd[f[We i [fZagf dWSV[^k VWfWd\_[`ST^W XS[d \_Sd] Wf hS^gWe SdW VWfWd\_[`WV TSeWV a` Uaef' ^Wee S`k [\_bS[d\_W`f' b^ge ad \_[`ge UZS`YWe [` XS[d hS^gW dWeg^f[`Y Xda\_ aTeWdhST^W bd[UW UZS`YWe [` adVWd^k fdS`eSUf[a`e Xad S` [VW`f[US^ ad e[\_[^Sd [`hWef\_W`f aX fZW eS\_W [eegWd) JZWeW eWUgd]ff[We SdW U^See[X[WV Se BWhW^. [` fZW XS[d hS^gW Z[WdSdUZk agf^[`WV STahW)

7 da^Xad i SdV aX fZW 9 a bS`kse  $Wcg[fk\ eWUgd[f[We\ U^See[X[WV\ Se\ BWhW^ .\ [e\ Se\ Xa^a\ i\ e5]]]]$ 

	;-	;_b dXU dXbUU ] _^dXc U^TUT HU`dU ] RUb .+'				
	<u></u>	-+-,	-+-+			
		\$Y^ ] Y\\Y_^c%				
8S^S`UW (TWY[``[`Y aX bWd[aV	!	,,1!	,			
7VV[f[a`e		,	1			
HWfgd`e aX USb[fS^		\$-/%	\$ - %			
CWSegdW_W`f SV\gef_W`fe		-/	p			
<adw[y`wjuzs`yws`v afzwd<sup="">\$S%</adw[y`wjuzs`yws`v>		\$-2%	-			
8S^S`UW (W`V aX bWd[aV	!	4+ !	, -4			

\$S% : gd[`Y fZW fZdWW \_a`fZe W`VWV IWbfW\_TWd .+' -+-,' fZW 9a\_bS`k dWU^See[X[WV [fe [`hWef\_W`f [` S` Wcg[fk eWUgd[fk Xda\_BWhW^ . fa BWhW^ , i [fZ[` fZW XS[d hS^gW Z[WdSdUZk Se fZW [`hWef\_W`f TWUS\_W bgT^[U^k fdSVWV [` fZW X[def cgSdfWd aX X[eUS^ -+--)

#### 9UbYfQdYfU >^cdbe ]U^dc

 $JZW \ 9a\_bS`k \ [eV[dWUf^kS]V \ [V[dWUf^kSXXWUfWV \ Tk \ d[e]eSeeaU[SfWV \ i \ [fZ \ UZS`YWe \ [` \ UWdfS[` \_Sd]Wf \ Ua`V[f[a`e) \ MZW` VWW_WV \ Sbbdabd[SfW' fZW \ 9a\_bS`k \ geWe \ VWd[hSf[hW \ [` efdg_W` fe \ fa \ \_[f[YSfW fZW \ bafW` f[S^ [\_bSUf \ aX \ fZWeW \ \_Sd]Wf \ d[e]e) \ JZW \ bd[\_Sdk \ \_Sd]Wf \ d[e]e \ \_S`SYWV \ Tk \ fZW \ 9a\_bS`k \ fZdagYZ \ fZW \ geW \ aX \ VWd[hSf[hW \ [` efdg_W` fe \ [` U^gVW5] \ AVWGW5 \$ 

n [`fWdWef dSfW d[e]5 Sd[e[`Y Xda\_ X[jWV S`V X^aSf[`Y dSfW <ajfW^ : WTf =dagb Tadda i [`Ye)

: Wd[hSf[hWe SdW U^See[X[WV Se UgddW^f ad `a`(UgddW^f [`fZW 8S^S`UW IZWWfe TSeWV a`fZW[d \_Sfgd[fk VSfWe) HWXWd fa fZW fST^W TW^a i Xad XgdfZWd VWfS[^e5

	7Q\Q^SU HXUUd A_SQd\\\^\ HU\\\dU ] RUb .+' -+-,		6c_V ?e^U .+' -+-,
		\$Y^ ] Y	\\Y_^c%
9daee UgddW`Uk [`fWdWef dSfW VWd[hSf[hWe ( XS[d hS^gW ZWVYWe	EfZWd UgddW`f SeeWfe	! ,+	! p
9daee UgddW`Uk [`fWdWef dSfW VWd[hSf[hWe	EfZWd UgddW`f SeeWfe	/ -	p
9daee(UgddW`Uk [`fWdWef dSfW VWd[hSf[hWe ( XS[d hS^gW ZWVYWe	EfZWd `a`(UgddW`f SeeWfe	4	,3
9daee(UgddW`Uk [`fWdWef dSfW VWd[hSf[hWe	EfZWd `a`(UgddW`f SeeWfe	.0	2.
?`fWdWef dSfW VWd[hSf[hWe ( USeZ X^a i ZWVYWe	EfZWd UgddW`f ^[ST[^[f[We	\$2%	\$1%
?`fWdWef dSfW VWd[hSf[hWe ( USeZ X^a i ZWVYWe	EfZWd`a`(UgddW`f^[ST[^[f[We	p	\$.%
9daee(UgddW`Uk [`fWdWef dSfW VWd[hSf[hWe	EfZWd UgddW`f ^[ST[^[f[We	\$.%	p
9daee(UgddW`Uk [`fWdWef dSfW VWd[hSf[hWe	$EfZWd `a`(UgddW`f `[ST[^[f[We$	\$3%	\$,.%

# $1 FXM KQT \setminus MJILJX$

JZW fafS^`af[a`S^hS^gW aX XadW[Y`UgddW`Uk Ua`fdSUf VWd[hSf[hWe VWe[Y`SfWV Xad ZWVY[`Yi W

JZW Xa^a i [`Y fST^We bdWeW`f fZW [_bSUf fZSf UZS`YWe [` fZW XS[d hS^gWe ZSV a` 7UUg_g^SfWV afZWd Ua_bdWZW`e[hW ^aee S`V fZW IfSfW_W`fe aX EbWdSf[a`e Vgd[`Y fZW fZdWW _a`fZe W`VWV IWbfW_TWd .+' -+-, S`V -+-+ Xad TafZ VWd[hSf[hWe VWe[Y`SfWV Se USeZ X^a i ZWVYWe fZSf Ua`f[`gW fa TW Z[YZ^k WXXWUf[hW S`V VWd[hSf[hWe [`[f]S^k VWe[Y`SfWV Se USeZ X^a i ZWVYWe Tgf Xad i Z[UZ ZWVYW SUUag`f[`Y i Se V[eUa`f[`gWV Se aX : WUW_TWd .,' -+-+5

# C: LH 8DGEDG6I>DC CDI:HIDI=: JC6J9>I:9 8DCHDA>96I:9;>C6C8>6A HI6I:B:CIH

#### CDI: 4): 6GC>C<H \$ADHH\(\text{E}:GH=6G:

 $JZW Xa^{a} i [Y fST^{W} eWf XadfZ fZW Ua\_bgfSf[a^aX TSe[U S^V V[^gfWV WSd^{Y} e^{aee}] bWd eZSdW g^VWd 7 I 9 -1 + 'q; Sd^{Y} ebWd IZSdWr5$ 

	;_b	] _^dXc U^TUT RUb .+'	
	-+-,		-+-+
	\$Y^	Y\\Y_^c' Uh   Q ] _6	SU`d`Ub cXQbU e^dc%
DWf [`Ua_W	!	-12	! /2
BWee5 DWf [`Ua_W Sffd[TgfST^W fa `a`Ua`fda^^[`Y [`fWdWefe		\$2,%	\$,.%
DWf [`Ua_W Sffd[TgfST^W fa DW i e 9adbadSf[a` efaU]Za^VWde	!	,41	! ./
$MW[YZfWV(ShWdSYW `g\_TWd aX eZSdWe aX Ua\_\_a`efaU] agfefS`V[`Y (TSe[U]) $		04,)2	034)0
: [^gf[hW WXXWUf aX Wcg[fk S i SdVe		-)2	,).
$MW[YZfWV(ShWdSYW `g_TWd aX eZSdWe aX Ua\a`efaU] agfefS`V[`Y ( V[^gfWV] aX eZSdWe aX Ua\_a`efaU] agfefaU] a$		04/)/	04+)3
DWf [`Ua_W Sffd[TgfST^W fa DWie 9adbadSf[a` efaU]Za^VWde bWd eZSdW (TSe[U S`V V[^gfWV	!	+)	! +)+1

#### CDI: ,+) 8DB B>IB: CIH 6C9 8DCI>C<: C8>: H

#### , KI I FP I BJPO

 $JZW\ 9a\_bS`k\ ZSe\ Ua\_\_[f\_W`fe\ g`VWd\ UWdfS[`X[d\_Ua`fdSUfgS^SddS`YW\_W`fe\ \$qX[d\_Ua\_\_[f\_W`fer\%\ fa\_S]W\ XgfgdW\ bSk\_W`fe) \\ JZWeW\ X[d\_Ua\_\_[f\_W`fe\ eWUgdW\ fZW\ XgfgdW\ d[YZfe\ fa\ hSd[age\ SeeWfe\ S`V\ eWdh[UWe\ fa\ TW\ geWV\ [`fZW\ `ad\_S^UagdeW\ aX\ abWdSf[a`e) \\ JZW\ 9a\_bS`kse\ Ua\_\_[f\_W`fe\ Se\ aX\ IWbfW\_TWd\ .+'-+-,\ ZShW\ `af\ UZS`YWV\ e[Y`[X[US`f^kXda\_fZW\ V[eU^aegdWe\ [`U^gVWV\ [`fZW\ -+-,\ <ad\_,\ +(A)$ 

#### , KJPFJDBJ@FB0

 $JZW\ 9a\_bS`k\ WefST^[eZWe\ S`\ SUUdgWV\ ^[ST[^[fk\ Xad\ ^WYS^\ U^S]\_e\ i\ ZW`\ [f\ VWfWd\_[`We\ fZSf\ S\ ^aee\ [e\ TafZ\ bdaTST^W\ S`V\ fZW\ S\_ag`f\ aX\ fZW\ ^aee\ US`\ TW\ dWSea`ST^k\ Wef[\_SfWV)\ E`UW\ WefST^[eZWV'\ SUUdgS^e\ SdW\ SV\gefWV\ Xda\_f[\_W\ fa\ f[\_W\ f]\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ f]\ fa\ f[\_W\ f]\ fa\ f[\_W\ f]\ fa\ f[\_W\ fa\ f[\_W\ f]\ fa\ f[\_W\$ 

#### $; J \setminus X / RJWNHF : FWPJYNSL$

?`  $CSk - + - + 'fZW 9a bS`k ea^V [fe DW i e 7 Wd[US CSd]Wf[`Y Tge[`Wee) ?` fZW fdS`eSUf[a`' fZW 9a bS`k dWfS[`WV UWdfS[` ^[ST[^[f[We' [`U^gV[`Y fZaeW Sd[e[`Y Xda fZW ^WYS^ bdaUWWV[`Ye i [fZ ?`e[Y`[S I kefW_e' ?`U) $q?`e[Y`[Sr% S`V LS^See[e 9a_g`[USf[a`e' ?`U) $qLS^See[er% VWeUd[TWV TW^a i )] $$$ 

#### 7SXNLSNF @^XYJRX\$ 7SH&

 $E \ @g^k \ , \ , ' -+ , 4' ?`e[Y`[S X[^WV S Ua\_b^S[^f [`fZW K)I) : [efd[Uf 9 agdf Xad fZW : [efd[Uf aX C[``WeafS SYS[`ef DW i e 7 _ Wd[US CSd] Wf[`Y < I? B)B)9) $qD7C < I?r\"DW i e 7 _ Wd[US CSd] Wf[`Y ?`(IfadW I Wdh[UWe B)B)9) $qD7C ?`(IfadWr\"S`V DW i e 9 adbadSf[a` $faY\"fZWd' fZW qD7C FSdf[Wer\"S^\WY[`Y h[a^Sf[a`e aX X\WV\WdS^S`V efSf\WS`f[fdgef ^S i e S`V Ua\_a` ^S i Tge[`Wee fadfe) JZW Ua_b^S[`f e\W]e fd\WT^\W VS_SY\We' [`\g`Uf[h\W d\W^[\WX S`V Sffad`\Wkes X\WWe S`V Uaefe) E` 7gYgef , /' -+ , 4' fZ\WD7C FSdf[\We S`e i \Wd\WY fZ\W Ua_b^S[`f S`V See\Wdf\WS Uag`f\Wd\S[_SYS[`ef ?`e[Y`[S Xad Td\WSUZ aX Ua`fdSUf' S^\WY[`Y fZSf ?`e[Y`[S h[a^Sf\WS bd]ad e\Wf^\W_\W_\W_\W' f T\Wf i \W\`D7C ?`(Ifad\WS`V ?`e[Y`[S) E` @g^k , +' -+-+' fZ\WD7C FSdf[\We X[^\WV S _af[a` Xad B\WS Y ] = ] $\left( -+ , -+ ) \ fZ\WD7C FSdf[\We X[^\WV S _af[a` Xad B\WS Y ] \ ] $\left( -+ , -+ ) \ fZ\WD7C FSdf[\We X[^\WV S _af[a` Xad B\WS Y ] \ ] $\left( -+ , -+ ) \ fZ\WD7C FSdf[\We X[^\WV S _af[a` Xad B\WS Y ] \ ] $\left( -+ , -+ ) \ fZ\WD7C FSdf[\We X[^\WV S _af[a` Xad B\WS Y ] \ ] $\left( -+ , -+ ) \ fZ\WD7C FSdf[\We X[^\WV S _af[a` Xad B\WS Y ] \ ] $\left( -+ , -+ ) \ fZ\WD7C FSdf[\We X[^\WV S _af[a` Xad B\WS Y ] \ ] $\left( -+ , -+ ) \ fZ\WD7C FSdf[\We X[^\WV S _af[a` Xad B\WS Y ] \ ] $\left( -+ , -+ ) \ fZ\WD7C FSdf[\We X[^\WV S _af[a` Xad B\WS Y ] \ ] $\left( -+ , -+ ) \ fZ\WD7C FSdf[\WS Y S _af[a` Xad B\WS Y ] \ ] $\left( -+ , -+ ) \ fZ\WD7C FSdf[\WS Y S _af[a` Xad B\WS Y ] \ ] $\left( -+ , -+ ) \ fZ\WD7C FSdf[\WS Y S _af[a` Xad B\WS Y S _af[a`$ 

# C: LH 8DGEDG6I>DC CDI:HIDI=: JC6J9>I:9 8DCHDA>96I:9;>C6C8>6A HI6I:B:CIH

#### CF0FXXNX 1TRRZSNHFYNTSX\$ 7SH&

# 6 FWUJW 1 TOONSX

#### $B \& 9 \& : J \setminus XUFUJW : FYYJWX$

 $9 [h[^ U^S] _ e ZShW TWW^ TdagYZf SYS[^ ef fZW 9a_bS^k i [fZ dWebWUf fa' S_a^Y afZWd fZ[^Ye' ha[UW_S[^ [^ WdUWbf[a^S^V [^ Sbbdabd[SfW bSk_W^fe fa bgT^[U aXX[U[S^e Sf fZW 9a_bS^kse Xad_Wd bgT^[USf[a^' AMJ ; J\X TX YMJ DTWQI' S^V Sf AMJ @ZS' S^V dW^SfWV _SffWde $fZW qK)A) DW i ebSbWd CSffWder%) JZW 9a_bS^k ZSe SV_[ffWV ^[ST[^fk [^ _S^k U[h[^ USeWe S^V ZSe eWff^WV S^g_TWd aX USeWe) JZW 9a_bS^k S^ea eWff^WV S^g_TWd aX U^S[_e fZdagYZ S bd[hSfW Ua_bW^eSf[a^eUZW_W i Z[UZ i Se U^aeWV fa ^W i U^S[_e SXfWd 7bd[^3' -+,.)]$ 

?` Ua``WUf[a` i [fZ fZW eWbSdSf[a` aX fZW 9a\_bS`k Xda\_ J i W`fk(<[def 9W`fgdk < aj'?`U) \$q-, ef 9W`fgdk < aj r% a` @g`W - 3' -+, .' fZW 9a\_bS`k S`V -, ef 9W`fgdk < aj SYdWWV [` fZW I WbSdSf[a` S`V : [efd[Tgf[a` 7 YdWW\_W`f fZSf -, ef 9W`fgdk < aj i ag^V [` VW\_\_`[Xk fZW 9a\_bS`k Xad bSk\_W`fe\_SVW SXfWd egUZ VSfW Sd[e[`Y agf aX U[h[^ U^S[\_e S`V [` hWef[YSf[a` e dW^Sf[`Y fa fZW K)A) DW i ebSbWd CSffWde Se i W^M Se ^WYS^S`V bdaXWee[a` S^ XWWe S`V WjbW`eWe bS[V [` Ua``WUf[a` i [fZ fZW bdWh[age^k Ua`U^gVWV Ud[\_[`S^ \_SffWde' afZWd fZS` XWWe' WjbW`eWe S`V Uaefe dW^Sf[`Y fa W\_b^akWWe \$[% i Za SdW` af V[dWUfade' aXX[UWde ad UWdfS[` VWe[Y`SfWV W\_b^akWWe ad \$[[% i [fZ dWebWUf fa U[h[^ \_SffWde' i Za SdW` af Ua(VWXW`VS` fe i [fZ fZW 9a\_bS`k ad -, ef 9W`fgdk < aj) -, ef 9W`fgdk < aj se [` VW\_`[X[USf[a` aT^[YSf[a` e i [fZ dWebWUf fa fZWeW\_SffWde SdW eWff^WV a` S` SXfWd(fSj TSe[e)?` CSdUZ -+, 4' Se bSdf aX fZW eWbSdSf[a` aX <EN 9adbadSf[a` \$q<ENr% Xda\_ -, ef 9W`fgdk < aj' fZW 9a\_bS`k' DW i e 9adb > a^V[`Ye KA # ?dW^S`V' -, ef 9W`fgdk < aj S`V <EN W`fWdWV [` fa S FSdf[S^ 7ee[Y` \_W`f S`V 7eeg\_bf[a` 7YdWW\_W`f' bgdegS`f fa i Z[UZ' S\_a`Y afZWd fZ[`Ye' -, ef 9W`fgdk < aj See[Y`WV' Ua`hWkWV S`V fdS`eXWddWV fa <EN S^^ aX [fe [`VW\_`[X[USf[a` aT^[YSf[a` e i [fZ dWebWUf fa fZW K)A) DW i ebSbWd CSffWde)

 $JZW \ 9a\_bS`k \ [e`af ST^W \ fa \ bdWV[Uf \ fZW \ g^f[\_SfW \ agfUa\_W \ ad \ Uaef \ aX \ fZW \ U[h[^ U^S[\_e) ?f \ [e \ baee[T^W \ fZSf \ fZWeW \ bdaUWWV[`Ye \ S`V \ S`V \ S`V \ SVhWdeW \ dWea^gf[a` fZWdWaX \ Uag^V \ VS\_SYW \ [fe \ dWbgfSf[a`' [\_bS[d \ [fe \ ST[^fk \ fa \ Ua`VgUf \ [fe \ Tge[`Wee \ S`V \ SVhWdeW^k \ SXXWUf \ [fe \ dWeg^fe \ aX \ abWdSf[a`e \ S`V \ X[`S`U[S^ Ua`V[f[a`)]]$ 

# <YM $\boldsymbol{J}$ W

 $JZW \ 9a\_bS`kse \ fSj \ dWfgd`e \ SdW \ egT\WUf \ fa \ a`(Ya[`Y \ dWh[W i \ S`V \ WjS\_[`Sf[a` Tk \ hSd[age \ fSj \ SgfZad[f[We) \ JSj \ SgfZad[f[We \_Sk `af \ SYdWW i \ [fZ \ fZW \ fdWSf\_W`f \ aX \ [fW\_e \ dWbadfWV \ [` fZW \ 9a\_bS`kse \ fSj \ dWfgd`e' S`V \ fZWdWXadW \ fZW \ agfUa\_W \ aX \ fSj \ dWh[W i \ e S`V \ WjS\_[`Sf[a`e \ US` TW \ g`bdWV[UfST^W)$ 

#### CDI: ,,)>C8DB: I6M:H

7 f fZW W`V aX WSUZ [`fWd[\_ bWd[aV' fZW 9a\_bS`k Wef[\_SfWe fZW S``gS^ WXXWUf[hW fSj dSfW S`V Sbb^[We fZSf dSfW fa [fe adV[`Sdk cgSdfWd^k WSd`[`Ye) JZW fSj WjbW`eW ad TW`WX[f dW^SfWV fa e[Y`[X[US`f' g`gegS^ ad WjfdSadV[`Sdk [fW\_e fZSf i [^^ TW eWbSdSfW^k dWbadfWV ad dWbadfWV `Wf aX fZW[d dW^SfWV fSj WXXWUf SdW [`V[h[VgS^k Ua\_bgfWV S`V dWUaY`[1WV [` fZW [`fWd[\_ bWd[aV [` i Z[UZ fZaeW [fW\_e aUUgd)?` SVV[f[a`' fZW WXXWUfe aX UZS`YWe [` W`SUfWV fSj ^S i e ad dSfWe ad fSj efSfge SdW dWUaY`[1WV [` fZW [`fWd[\_ bWd[aV [` i Z[UZ fZaeW UZS`YW aUUgde)]]]]]]

<ad fZW fZdWW

; jUZS`YW q7INr% 7IN5H; 7%) H; 7 =dagb SVhWdf[eWe bdabWdfk S`V bdabWdfk(dW^SfWV eWdh[UWe a` [fe i WTe[fWe S`V \_aT[^W Sbbe' [` U^gV[`Y 7 gefdS^[Sse ^WSV[`Y dWe[VW`f[S^' Ua \_ \_WdU[S^ S`V eZSdW bdabWdfk i WTe[fWe' dWS^WefSfW)Ua \_)Sg' dWS^Ua \_ \_WdU[S^)Ua \_)Sg S`V <^Sf \_SfWe)Ua \_)Sg' S`V bdabWdfk badfS^e [` ?`V[S S`V ; Sef 7e[S) ?` SVV[f[a`'H; 7 =dagb bdah[VWe bdabWdfk(dW^SfWV VSfS fa fZW X[`S`U[S^ eWUfad S`V X[`S`U[S^ eWdh[UWe fZdagYZ S` W`V( fa(W`V V[Y]fS^ bdabWdfk eWSdUZ S`V X[`S`U[`Y Wj bWd[W`UW S`V S adfYSYW Tda][`Y aXXWd[`Y)

 $C \ ahW \ [e \ S^WSV[`Y \ bdah[VWd \ aX \ V[Y[fS^ \ dWS^ \ wefSfW \ eWdh[UWe \ [` fZW \ K)I) \ S^V \ bd[\_ Sd[^k \ abWdSfWe \ dWS^fad)Ua\_^\circ' \ S \ bdW\_[Wd \ dWS^ \ wefSfW \ [`Xad\_Sf[a`' \ SVhWdf[e[`Y \ S^V \ eWdh[UWe \ b^SfXad\_) \ C \ ahW \ aXXWde \ dWS^ \ wefSfW \ SVhWdf[e[`Y \ ea^gf[a`e \ fa \ SYW^ fe \ S^V \ Tda] \ Wde' \ [` U^gV[`Y \ [fe \ 9a`` WUf[a`e^{IC} \ F^ge \ S^V \ 7 \ VhS^ fSYW^{IC} \ Fda \ bdaVgUfe \ Se \ i \ W^S \ Se \ [fe \ dWXWddS^(TSeWV \ eWdh[UW' \ HWSVk \ 9a`` WUf \ 9a`U[WdYW) \ C \ ahW \ S^ea \ aXXWde \ a`^[`W \ faa^e \ S^V \ eWdh[UWe \ fa \ Va([f(kagdeW^X \ S^V^adVe \ S^V \ fW^S^fe' \ Se \ i \ W^S \ S^ea \ aXYWee[a`S^V \ eWdh[UWe \ bdaVgUfe)]$ 

f

# C: LH 8DGEDG6I>DC CDI:HIDI=: JC6J9>I:9 8DCHDA>96I:9 ;>C6C8>6A HI6I:B:CIH

 $e[\_[^Sd^k f[f^WV _WSegdWe dWbadfWV Tk afZWd Ua_bS^[We'e[^UW Ua_bS^[We S^V [^hWefade _Sk V[XXWd Se fa i ZSf [fW_e eZag^V TW [^U^gVWV [^fZW US^Ug^Sf[a^a aX IWY_W^f ; 8?J:7)]]]]]]$ 

 $IWY\_W^f; 8?J: 7 \ [efZW bd[\_Sdk \_WSegdW geWV Tk fZW 9a\_bS^kse UZ[WX abWdSf[^Y VWU[e[a^\_S]]Wd fa WhS^gSfW fZW bWdXad\_S^UW aX S^V S^aUSfW dWeagdUWe i [fZ[^fZW 9a\_bS^kse Tge[^WeeWe) IWY_W^f; 8?J: 7 bdah[VWe _S^SYW_W^f' [^hWefade S^V Wcg[fk S^S^kefe i [fZ S _WSegdW fa S^S^k]W fZW abWdSf[^Y bWdXad_S^UW aX WSUZ aX fZW 9a_bS^kse Tge[^Wee eWY_W^fe S^V [fe W^fWdbd[eW hS^gW SYS[^ef Z[efad[US^VSfS S^V Ua_bWf[fades VSfS' S^fZagYZ Z[efad[US^V dWeg^fe _Sk af TW [^V[USf[hW aX XgfgdW dWeg^fe $Se abWdSf[^Y bWdXad_S^UW [^U^gV[^Y Ugefa_Wd fSefWe S^V bdWXWdW^UWe\%)]$ 

IWY\_W`f [`Xad\_Sf[a` [e eg\_\_Sd[1WV Se Xa^a i e5

	;_	;_b dXU dXbUU ]_^dXc HU`dU] RUb .+'			
		-+-,	-+-+		
		\$1, ] !//.	^c%		
HWhW`gWe5					
: [Y[fS^ HWS^ ; efSfW IWdh[UWe	!	/-1!	-4+		
IgTeUd[bf[a`L[VWa IWdh[UWe		0, +	/41		
:ai @a`We		///	.31		
8aa] FgT^[eZ[`Y		0/1	/03		
DWie CWV[S		021	/32		
EfZWd		p	p		
J afS^ dWhW`gWe	!	-'0+-!	-',,2		
IWY_W`f;8?J:75					
: [Y[fS^ HWS^ ; efSfW IWdh[UWe	!	,.3 !	, ,4		
IgTeUd[bf[a`L[VWa IWdh[UWe		,,/	23		
:ai @a`We		40	2-		
8aa] FgT^[eZ[`Y		30	2,		
DW i e CWV[S		./	\$%		
EfZWd		\$01%	\$O+%		
: WbdWU[Sf[a` S`V S_adf[1Sf[a`		\$,10%	\$,1/%		
?_bS[d_W`f S`V dWefdgUfgd[`Y UZSdYWe		\$%	\$/+%		
; cg[fk ^aeeWe aX SXX[^[SfWe		p	\$,%		
?`fWdWef Wj bW`eW' `Wf		\$%	\$3%		
EfZWd'`Wf		, . 2	,2		
?`Ua_W TWXadW [`Ua_W fSj WjbW`eW		3	2-		
?`Ua_WfSj WjbW`eW		\$2,%	\$-O%		
DWf[`Ua_W	!	-12!	/2		

	HU`dU ]	6c_V ] RUb .+' -+-,	6c_V ?e^U .+' -+-,
		\$Y^ ] Y\	\Y_^ <b>c</b> %
J afS^ SeeWfe5			
: [Y[fS^ HWS^ ; efSfW IWdh[UWe	!	- '43.	! .',/1
IgTeUd[bf[a` L[VWa IWdh[UWe		.'.0/	. '0,0
:ai @a`We		-'3+-	- '243
8aa] FgT^[eZ[`Y		-'2/2	-'2,.
DWie CWV[S		-',2-	-'-+4
$EfZWd^{SS}$		,'31,	-'+.4
?`hWef_W`fe		/44	.0,
J afS^ SeeWfe	!	,1'/,3	! ,1'22,

 $\$  JZW EfZWd eWY\_W`f bd[\_Sd[^k [`U^gVWe 9SeZ S`V USeZ Wcg[hS^W`fe)]

	6c_V _HU`dU] RUb.	6c_V HU`dU]RUb.+'-+-,	
		\$Y^ ] Y\	\\Y_^ <b>c</b> %
= $aaV i [^{\wedge} S^{\vee} V [^{f}S^{\vee} Y [T^{\wedge}W SeeWfe' ^{\vee}Wf5]]$			
: [Y[fS^ HWS^ ; efSfW IWdh[UWe	!	, '3-0	! ,'32,
IgTeUd[bf[a`L[VWa IWdh[UWe		, '0-2	,'1,-
:ai @a`We		,'44+	,'440
8aa] FgT^[eZ[`Y		<b>,</b> '+	,'+/1
DW i e CWV[S		-44	.+3
$JafS^{\wedge} = aaV i [^{\wedge} S^{\vee} [^{f}S^{\vee} Y]T^{\wedge}W SeeWfe'^{\vee} Wf$	!	1'12/	! 1'3

# CDI: ,.) 699>I>DC6A;>C6C8>6A>C;DGB6I>DC

**9**B@BFR>?HBO\$ **J**BP

HWUW[hST^We

# C: LH 8DGEDG6I>DC CDI:HID I=: JC6J9>I:9 8DCHDA>96I:9 ;>C6C8>6A HI6I:B:CIH

# : QLLHB I BJP>H , >OE / HKS 2JCKN I >PFKJ

JZW Xa^^a i [`Y fST^W eWfe XadfZ fZW 9 a \_ bS`kse USeZ bS[V Xad fS j We S`V [`fWdWef5

		;_b dXU dXbUU HU`dU]	] _^dXc	J^TUT	
		-+-,		-+-+	
		\$1.	Y\\Y_^ <b>c</b> %		
9SeZ bS[V Xad [`fWdWef	!	,/	!	, 1	
9 SeZ bS[V Xad fS j We	!	/0	!		

# >I : B -) B 6C6 < : B : CIkH 9>H8 JHH>DC 6C9 6C6ANH>H D; ;>C6C8>6A 8DC9>I>DC 6C9 G : HJAIH D; DE : G6 I>DCH

 $A\textit{MNX} \ ITHZRJSY\$ \ \textit{NSHQZINSL} \ \textit{YMJ} \ \textit{KTQQT} \setminus \textit{NSL} \ \textit{INXHZXXNTS} \ \textit{FSI} \ \textit{FSFQ^XNX\$} \ \textit{HTSYFNSX} \ \textit{XYFYJRJSYX} \ \textit{YMFY} \ \textit{HTSXYNYZYJ} \ \_\textit{KTW} \setminus \textit{FWIMQTTPNSL}$ 

; jUZS`YW q7INr% 7IN5H; 7%) H; 7 = dagb SVhWdf[eWe bdabWdfk S`V bdabWdfk(dW^SfWV eWdh[UWe a` [fe i WTe[fWe S`V \_aT[^W Sbbe' [` U^gV[`Y 7 gefdS^[Sse ^WSV[`Y dWe[VW`f[S^' Ua \_ \_WdU[S^ S`V eZSdW bdabWdfk i WTe[fWe' dWS^WefSfW)Ua \_)Sg' dWS^Ua \_ \_WdU[S^)Ua \_)Sg S`V <^Sf\_SfWe)Ua \_)Sg' S`V bdabWdfk badfS^e [` ?`V[S S`V ; Sef 7 e[S) ?` SVV[f[a`'H; 7 = dagb bdah[VWe bdabWdfk(dW^SfWV VSfS fa fZW X[`S`U[S^ eWUfad S`V X[`S`U[S^ eWdh[UWe fZdagYZ S` W`V( fa(W`V V[Y[fS^ bdabWdfk eWSdUZ S`V X[`S`U[`Y Wj bWd[W`UW S`V S \_adfYSYW Tda][`Y aXXWd[`Y)

 $C \ ahW \ [e \ S^WSV[`Y \ bdah[VWd \ aX \ V[Y[fS^ \ dWS^ \ WefSfW \ eWdh[UWe \ [` \ fZW \ K)I) \ S^V \ bd[\_Sd[^k \ abWdSfW \ dWS^fad)Ua\_^\circ' \ S \ bdW\_[Wd \ dWS^ \ WefSfW \ [` Xad\_Sf[a`' \ SVhWdf[e[`Y \ S^V \ eWdh[UWe \ b^SfXad\_) \ C \ ahW \ aXXWde \ dWS^ \ WefSfW \ SVhWdf[e[`Y \ ea^gf[a`e \ fa \ SYW^ fe \ S^V \ Tda]Wde' \ [` U^gV[`Y \ [fe \ 9a``WUf[a`e^{I^C} \ F^ge \ S^V \ 7 \ VhS^ fSYW^{I^C} \ Fda \ bdaVgUfe \ Se \ i \ W^A \ Se \ [fe \ dWXWddS^(TSeWV \ eWdh[UW' \ HWSVK \ 9a``WUf \ 9a`U[WdYW) \ C \ ahW \ S^ea \ aXXWde \ a`^[`W \ faa^e \ S^V \ eWdh[UWe \ fa \ Va([f(kagdeW^X \ S^V^adVe \ S^V \ fW`S^fe' \ Se \ i \ W^A \ Se \ bdaXWee[a`S^V \ eWdh[UWe \ bdaVgUfe)$ 

# :Q?O@NFLPFKJ =FABK : BNRF@BO p JZW 9a\_bS`kse IgTeUd[bf[a` L[VWa IWdh[UWe eWY\_W`f bdah[VWe ebadfe'
W`fWdfS[`\_W`f S`V `W i e eWdh[UWe fa bSk(JL S`V efdWS\_[`Y egTeUd[TWde S`V afZWd Ua\_\_WdU[S^^[UW`eWWe' bd[\_Sd[^k
h[S UST^W' eSfW^[fW S`V [`fWd`Wf V[efd[Tgf[a`' S`V Ua`e[efe aX \$[% fZW 9a\_bS`kse 10 " [`fWdWef [` fZW <ajfW^ =dagb
\$ i [fZ fZW dW\_S[`] Y .0 " [`fWdWef ZW^V Tk JW^efdS' S` 7 IN(^[efWV fW^WUa\_\_g`[USf[a`e Ua\_bS`k% S`V \$[[% 7 gefdS^[S`
DW i e 9ZS``W^ \$q 7 D 9 r%) JZW <ajfW^ =dagb [e fZW ^SdYWef 7 gefdS^[S` (TSeWV egTeUd[bf[a` fW^Wh[e[a` bdah[VWd' i [fZ
`WSd^k -++ UZS``W^e UahWd[`Y ebadfe' YW`WdS^ W` fWdfS[`\_W`f' \_ah[We' VaUg\_W`fSd[We' \_ge[U' UZ[^VVdW` se
bdaYdS\_\_[`Y S`V `W i e) <ajfW^ S`V fZW ASka Ibadfe efdWS\_[`Y eWdh[UW aXXWd fZW ^WSV[`Y ebadfe bdaYdS\_\_[`Y
Ua`fW`f [` 7 gefdS^[S' i [fZ TdaSVUSef d[YZfe fa ^[hW ebadf[`Y WhW`fe [`U^gV[`Y5 DSf[a`S^ HgYTk BWSYgW' 7 gefdS^[S`
<aafTS^ BWSYgW' 9d[U] Wf 7 gefdS^[S S`V hSd[age \_afadebadfe bdaYdS\_\_[`Y) JZW <ajfW^ =dagb S^ea abWdSfWe
O7; 53' [fe a`(VW\_S`V W`fWdfS[`\_W`f efdWS\_[`Y eWdh[UW' S`V <ajfW^ Da i'S efdWS\_[`Y eWdh[UW fZSf bdah[VWe SUUWee
SUdaee <ajfW^se ^[hW S`V a`(VW\_S`V Ua`fW`f)?` EUfaTWd -+-,' fZW <ajfW^ =dagb ^Sg`UZWV <^SeZ' S`W i e
SYYdWYSf[a` efdWS\_[`Y eWdh[UW)</pre>

7D9 abWdSfWe fZW IAO D; MI `Wf i ad]' 7 gefdS^[Sse -/(Zagd \_g^f[(UZS``W^' \_g^f[(b^SfXad\_ `W i e eWdh[UW) 7D9 UZS``W^e SdW V[efd[TgfWV fZdagYZagf 7 gefdS^[S S`V DW i PWS^S`V S`V ShS[^ST^W a` <a j fW^ S`V I]k DWf i ad] JW^Wh[e[a` DP) 7D9 S^ea a i`e S`V abWdSfWe fZW [`fWd`Sf[a`S^ 7 gefdS^[S 9ZS``W^?FJL eWdh[UW S`V aXXWde Ua`fW`f SUdaee S hSd[Wfk aX V[Y[fS^ \_WV[S b^SfXad\_e' [`U^gV[`Y i WT' \_aT[^W S`V fZ[dV bSdfk bdah[VWde)]] bdfk bdah[VWde)

- KS 3KJB0 p JZW : a i @a`We eWY \_ W`f Ua`e[efe aX : a i @a`We'S Y^aTS^ bdah[VWd aX`WieS`V Tge[`Wee [`Xad\_Sf[a`'] ZT 76.5 404.0701 ( D) i Z[UZ V[efd[TgfWe ffe]]a`fw`f \$`V VSf\$ fZdagYZ \$ h\$d[Wfk aX ) WV[\$ UZ\$``W^e [`U\gVVY`X] eb\$bWde'`Wiei[dWe'] ( D) i WTeffWe'\$bbb^[USf[a'e']a d\$bbe'Xad \_aT[^W VWh[UWe']f\$T^Wfe \$`V W(Taa]dW\$VWde'`Wie^WffWde' \_\$\$Y\$1[ We' bdabd[Wf\$dk') ( X)( Q)( W VSf\$T\$eWe'^[hW \agd`\$^e\_' h[VWa \$`V baVU\$efe) JZW : a i @a`We eWY \_ W`fse bdaVgUfe' i Z[UZ f\$dYWf [`V[h[Vg\$^Ua`eg \_Wde \$`V W`fWdbd[eW Ugefa \_Wde' [`U^gVW AMJ DFQ @YWJJY 8TZW\$FQ' <\$Uf[h\$' : a i @a`We H[e] # 9a\_b^[\$`UW' : a i @a`We DW i e i [dWe' OFWWT\$aX' C \$d] WfM\$fUZ \$`V ?`hWefadse 8ge[`Wee : \$[^k])
  - W +KKG 8Q?\( BOE\( JD\) p JZ\( \) 8aa\( \) FgT^\( eZ\) \( \) Y \( \) WY \( \) WY \( \) WY \( \) Ua\( \) e[efe a\( \) > Sdb\( \) 9a^\( \) \( \) e' fZ\( \) e\( \) wUa\( \) V \( \) SdY\( \) Ua\( \) eg \( \) WdS^\( \) X[Uf[a\( \) ' \\ a\( \) X[Uf[a\( \) X[Uf[a\( \) ' \\ a\( \) X[Uf[a\( \) X[Uf[a\( \) ' \\ a\( \) X[Uf[a\( \) X[U

 $JZW\ HWbgdUZSeW\ FdaYdS\_\ dWb^SUWe\ fZW\ 9a\_bS`kse\ !O++\_[^{[a]}\ 9^See\ 7\ 9a\_a`\ IfaU]\ dWbgdUZSeW\ bdaYdS\_\ SbbdahWV\ Tk\ fZW\ 9a\_bS`kse\ 8aSdV\ aX: [dWUfade\ fZW\ q8aSdV\ aX: [dWUfader\ [`CSk-+,..)\ JZW\_S``Wd'\ f[\_[`Y'`g\_TWd\ S`V\ eZSdW\ bd[UW\ aX\ S`k\ dWbgdUZSeWe\ i\ [^{A}\ TW\ VWfWd\_[`WV\ Tk\ fZW\ 9a\_bS`k\ Sf\ [fe\ V[eUdWf[a`\ S`V\ i\ [^{A}\ VWbW`V\ gba`\ egUZ\ XSUfade\ Se\ fZW\_Sd]\ Wf\ bd[UW\ aX\ fZW\ efaU]'\ YW`\ WdS^-\_Sd]\ Wf\ Ua`V[f[a`e'\ Sbb^{[UST^W}\ eWUgd[f[We\ ^S\ i\ e'\ S^fWd`\ Sf[hW\ [`hWef\_W`f\ abbadfg`[f[We\ S`V\ afZWd\ XSUfade)\ JZW\ HWbgdUZSeW\ FdaYdS\_ZSe`a\ f[\_W\ ^[f]\ S`V\ _Sk\ TW\ _aV[X[WV'\ egebW`\ VWV\ ad\ V[eUa\ f[\ gWV\ Sf\ S`k\ f[\_W)$ 

# 9. \* ONKQL 0>HB KC 5>H>U0F>>JA; E>FH>JA?Q0FJB00B0

?` 7gYgef -+-,'H; 7 =dagb SUcg[dWV S`, 3" [`fWdWef \$,1)1" a` S V[^gfWV TSe[e% [` FdabWdfk=gdg FfW) BfV) \$qFdabWdfk=gdgr%' S ^WSV[`Y V[Y[fS^ bdabWdfk fWUZ`a^aYk Ua\_bS`k abWdSf[`Y\_Sd]Wfb^SUWe [` IagfZWSef 7e[S' [` WjUZS`YW Xad S^ eZSdWe aX H; 7 =dagbse W`f[f[We [` CS^Ske[S S`V JZS[^S`V) JZW fdS`eSUf[a` i Se Ua\_b^WfWV SXfWd H; 7 =dagb W`fWdWV [`fa S` SYdWW\_W`f fa eW^ [fe -2" [`fWdWef [` [fe Wj[ef[`Y hW`fgdW i [fZ 44)Ua) JZW fdS`eSUf[a` UdWSfWV S ^WSV[`Y V[Y[fS^ dWS^ WefSfW eWdh[UWe Ua\_bS`k [` IagfZWSef 7e[S S`V `W i abbadfg`[f[We Xad Ua^STadSf[a` S`V SUUWee fa S VWWbWd baa^ aX WjbWdf[eW' fWUZ`a^aYk S`V [`hWef\_W`f [` fZW dWY[a`) H; 7 =dagb dWUW[hWV a`W eWSf a` fZW TaSdV aX V[dWUfade aX FdabWdfk=gdg Se bSdf aX fZW fdS`eSUf[a`)

G:HJAIHD; DE:G6I>DCH

9BOQHPO KC 7LBN>PFKJOX/KN PEB

#### IQR\U V 8 ^dU^dc

 $bdaVgUf[a` Uaefe dWUaY`[1WV [` fZW bd[ad kWSd fZSf i WdW VWXWddWV Xda _ X[eUS^-+-+ VgW fa fZW Uada`Sh[dge bS`VW_[U $q9EL?:(,4r\%) JZW [_bSUf aX XadW[Y` UgddW`Uk X^gUfgSf[a`e aX fZW K)I) Va^Sd SYS[`ef ^aUS^ UgddW`U[We dWeg^fWV [` S` EbWdSf[`Y WjbW`eW [` UdWSeW aX !-2 _[^^[a`'ad - "' Xad fZW fZdWW _a`fZe W`VWV IWbfW_TWd .+' -+- , Se Ua_bSdWV fa fZW UaddWeba`V[`Y bWd[aV aX X[eUS^-+- ,))$ 

: BHHFJD\$ DBJBN>H > JA > A I FJF0PN>PFRB p I W^[`Y' YW`WdS^ S`V SV\_[`[efdSf[hW [`UdWSeWV !, 1. \_[^[a`' ad -/ "' Xad fZW fZdWW \_a`fZe W`VWV I WbfW\_TWd .+' -+-, Se Ua\_bSdWV fa fZW UaddWeba`V[`Y bWd[aV aX X[eUS^ -+-,)

-BLNB@F>PFKJ > JA > I KNPFV>PFKJ p : WbdWU[Sf[a`S`V S\_adf[1Sf[a`WjbW`eW [`UdWSeWV!, \_[^^[a`'ad, "'Xad fZW fZdWW\_a`fZe W`VWV IWbfW\_TWd.+'-+-, Se Ua\_bSdWV fa fZW UaddWeba`V[`Y bWd[aV aX X[eUS^-+-,) JZW [\_bSUf aX XadW[Y` UgddW`Uk X^gUfgSf[a`e aX fZW K)I) Va^Sd SYS[`ef ^aUS^ UgddW`U[We dWeg^fWV [`S:WbdWU[Sf[a`S`V S\_adf[1Sf[a`WjbW`eW [`UdWSeW aX !. \_[^[a`'ad-"'Xad fZW fZdWW \_a`fZe W`VWV IWbfW\_TWd.+'-+-, Se Ua\_bSdWV fa fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+-,)

.  $MQFPU\ HKOOBO\ KC > CCFHF > PBO\ p$ ;  $cg[fk ^aeeWe\ aX\ SXX[^[SfWe\ VWUdWSeWV\ Tk\ !\ ,\ _[^n[a`\ Xad\ fZW\ fZdWW\ _a`fZe\ W`VWV\ IWbfW_TWd\ .+' -+-,$  Se Ua \_bSdWV fa fZW UaddWeba`V[`Y\ bWd[aV\ aX\ X[eUS^ -+-,)\ IWW\ DafW\ O\ p\ ?`hWef\_W`fe\ [`\ fZW\ SUUa \_bS`k[`Y\ 9\ a`ea^[VSfWV\ <[`S`U[S^ IfSfW\_W`fe)\ ]

2JPBNBOP BTLBJOB\$ JBP p ?`fWdWef WjbW`eW'`Wf [`UdWSeWV Tk !,/ \_[^[a` Xad fZW fZdWW \_a`fZe W`VWV IWbfW\_TWd .+' -+-, Se Ua\_bSdWV fa fZW UaddWeba`V[`Y bWd[aV aX X[eUS^ -+-,' bd[\_Sd[^k Vd[hW` Tk fZW [eegS`UW aX !, T[^[a` aX eW`[ad`afWe [` fZW XagdfZ cgSdfWd aX X[eUS^ -+-, \$fZW q-+-, IW`[ad DafWer%])

2J@KIBP>TBTLBJOB p <ad fZW fZdWW \_a`fZe W`VWV IWbfW\_TWd .+' -+-,' fZW 9a\_bS`k dWUadVWV [`Ua\_W fSj WjbW`eW aX !2, \_[^[a`a`bdW(fSj [`Ua\_W aX !..3 \_[^[a`'dWeg^f[`Y [`S`WXXWUf[hW fSj dSfW fZSf [e WcgS^ fa fZW K)]]) efSfgfadk fSj dSfW) JZW fSj dSfW i Se [\_bSUfWV Tk XadW[Y`abWdSf[a`e i Z[UZ SdW egT\WUf fa Z[YZWd fSj dSfWe S`V Tk hS^gSf[a`S^a i S`UWe dWUadVWV SYS[`ef fSj TW`WX[fe [`UWdfS[`Tge[`WeeWe i [fZ abWdSf[`Y ^aeeWe' aXXeWf Tk fZW ^a i Wd fSj [\_bSUf dW^SfWV fa fZW SUcg[e[f[a`aXS`,3" [`fWdWef [`FdabWdfk=gdg)

CS`SYW\_W`f SeeWeeWe ShS[^ST^W Wh[VW`UW fa VWfWd\_[`W i ZWfZWd egXX[U[W`f XgfgdW fSjST^W [`Ua\_W i [^ TW YW`WdSfWV fa bWd\_[f fZW geW aX Wj[ef[`Y VWXWddWV fSj SeeWfe) 8SeWV a` \_S`SYW\_W`fse SeeWee\_W`f aX ShS[^ST^W Wh[VW`UW' [f ZSe TWW` VWfWd\_[`WV fZSf [f [e \_adW ^[]W^k fZS` `af fZSf VWXWddWV fSj SeeWfe [` UWdfS[` XadW[Y` \gd[eV[Uf[a`e \_Sk `af TW dWS^[1WV S`V fZWdWXadW' S hS^gSf[a` S^a i S`UW ZSe TWW` WefST^[eZWV SYS[`ef fZaeW fSj SeeWfe)

 $6BP FJ@KIB p DWf [`Ua\_W Xad fZW fZdWW \_a`fZe W`VWV IWbfW\_TWd .+'-+-, [`UdWSeWV Tk !--+ \_[^[a` Se Ua\_bSdWV fa fZW UaddWeba`V[`Y bWd[aV aX X[eUS^-+-,'bd[\_Sd[^k Vd[hW` Tk Z[YZWd JafS^ IWY_W`f ; 8?J : 7 S`V Z[YZWd EfZWd'`Wf' bSdf[S^k aXXeWf Tk Z[YZWd fSj WjbW`eW)$ 

6BP FJ@KIB >PPNF?QP>?HB PK JKJ@KJPNKHHFJD FJPBNB0P0 p DWf [`Ua\_W Sffd[TgfST^W fa `a`Ua`fda^^[`Y [`fWdWefe [`UdWSeWV Tk !03 \_ [^[a` Xad fZW fZdWW \_a`fZe W`VWV IWbfW\_TWd .+' -+- , Se Ua\_bSdWV fa fZW UaddWeba`V[`Y bWd[aV aX X[eUS^ -+- ,' bd[\_Sd[^k

#### IQR\U V 8 ^dU^dc

 $Vd[hW`Tk [`UdWSeWV WSd`[`Ye Sf H; 7 = dagb' i Z[UZ [`U^gVWV fZW !, +2 _[^A[a`YS[`Xda_fZW V[ebae[f[a`aX [fe W`f[f[We [`CS^Ske[S S`V JZS[^S`V)]]]]] ] ] ] ] ] ] \\$ 

#### :BD I BJP \* J>HUOFO

 $IWY \_W`f ; 8?J : 7 [e fZW bd[\_Sdk \_WSegdW geWV Tk fZW 9a\_bS`kse UZ[WX abWdSf[`Y VWU[e[a`\_S]Wd fa WhS^gSfW fZW bWdXad\_S`UW aX' S`V S^aUSfW dWeagdUWe i [fZ[`'fZW 9a\_bS`kse Tge[`WeeWe) IWY \_W`f ; 8?J : 7 bdah[VWe _S`SYW \_W`f' [`hWefade S`V Wcg[fk S`S^kefe i [fZ S _WSegdW fa S`S^klW fZW abWdSf[`Y bWdXad _S`UW aX WSUZ aX fZW 9a _bS`kse Tge[`Wee eWY _W`fe S`V [fe W`fWdbd[eW hS^gW SYS[`ef Z[efad[US^ VSfS S`V Ua _bWf[fades VSfS' S^fZagYZ Z[efad[US^ dWeg^fe _Sk `af TW [`V[USf[hW aX XgfgdW dWeg^fe $Se abWdSf[`Y bWdXad _S`UW [e Z[YZ^k Ua`f[`YW`f a` _S`k XSUfade' [`U^gV[`Y Ugefa _Wd fSefWe S`V bdWXWdW`UWe%)$ 

 $JafS^{\ IWY\_W^{\ i}}; 8?J: 7 \ [e\ S^{\ a}] : 9 \ [e\ S^{\ a}] : 9$ 

 $JZW Xa^{A}a i [Y fST^{W} dWUa^{U}^{W} DWf [Ua_W fa_JafS^{IWY_W^{f}}; 8?J:7 Xad fZW fZdWW_a^{f}ZW VWV IWbfW_TWd_.+'-+-, S^V_-+-+5 ]$ 

	;_b dXU dXbUU HU`dU ]		
	-+-,	-+-+	
\$[`_[^[a`e\			
DWf [`Ua_W	! -12	! /2	
7 VV5			
?`Ua_WfSj WjbW`eW	2,	-0	
EfZWd'`Wf	\$,.2%	\$,2%	
?`fWdWef WjbW`eW'`Wf		3	
; cg[fk ^aeeWe aX SXX[^[SfWe	p	,	
?_bS[d_W`fS`V dWefdgUfgd[`Y UZSdYWe		/+	
: WbdWU[Sf[a`S`VS_adf[1Sf[a`	,10	,1/	
JafS^ IWY_W`f; 8?J: 7	! /,+	! -13	

JZW Xa^a i [Y fST^W eWfe XadfZ fZW 9a\_bS`kse HWhW`gWe S`V IWY\_W`f; 8?J: 7 Tk dWbadfST^W eWY\_W`f Xad fZW fZdWW\_a`fZe W`VWV IWbfW\_TWd .+' -+-, S`V -+-+5

;\_b dXU dXbUU ]\_^dXc U^TUT HU`dU ] RUb .+' HUW ] U^d : 7>I 9 6 HUW ] U^d : 7>I 9 6 \$[`\_[^^[a`e% GUfU^eUc  $GUfU^{\wedge}eUc$ /-1! : [Y[fS^ HWS^ ; efSfW IWdh[UWe , . 3 -4+ , ,4 IgTeUd[bf[a` L[VWa IWdh[UWe 0, +/41 23 ,,/ :ai@a`We /// 40 .31 2-8aa] FgT^[eZ[`Y 0/130 /03 2, DWie CWV[S 021 ./ /32 \$--% EfZWd \$01% \$0+% p p J afS<sup>^</sup> -'O+-/,+ -',,2! -13

- FDFP>H 9B>H . OP>PB : BNRF@BO \$,2 " S`V ,/ " aX fZW 9a\_bS`kse Ua`ea^[VSfWV dWhW`gWe [` fZW fZdWW \_a`fZe W`VWV IWbfW\_TWd .+' -+-, S`V -+-+' dWebWUf[hW^k%

	;_b dXU dXbUU ]_^dXc U^TUT HU`dU ] RUb .+'			dU ] RUb .+'
	-+-,	-+-+	8XQ^WU	" 8XQ^WU
\$[`_[^[a`e'WjUWbf "%			7 UddUb*	\$ L _bcU%
HWhW`gWe5				
9[dUg^Sf[a`S`V egTeUd[bf[a`	! .	! 3	! \$O%	\$1.%"
7VhWdf[e[`Y		-3	0	,3 "
HWS^ WefSfW	+	0	30	.1 "
EfZWd	2+	,4	0,	&&
I_dQ\ GUfU^eUc	/-1	-4+	,.1	/2 "
EbWdSf[`Y Wj bW`eWe	\$01%	\$/.%	\$,.%	\$.+%"
IW^^[`Y' YW`WdS^ S`V SV_[`[efdSf[hW	\$%	\$,-3%	\$,+/%	\$3,%"
HUW] U^d:7>196	! ,.3	! ,,4	! ,4	,1 "

&& `af \_WS`[`YXg^

<ad fZW fZdWW \_a`fZe W`VWV IWbfW\_TWd .+' -+-,' dWhW`gWe Sf fZW : [Y[fS^ HWS^ ;efSfW IWdh[UWe eWY\_W`f [`UdWSeWV !,.1 \_[^^[a`' ad /2"'Se Ua\_bSdWV fa fZW UaddWeba`V[`Y bWd[aV aX X[eUS^-+-,) HWhW`gWe Sf H; 7 =dagb [`UdWSeWV !4/ \_[^[a`' ad 1-"' fa !-/1 \_[^[a` Xad fZW fZdWW \_a`fZe W`VWV IWbfW\_TWd .+'-+-, Xda\_!,0- \_[^[a` [` fZW UaddWeba`V[`Y bWd[aV aX X[eUS^-+-,'

: Q?0@NFLPFKJ =FABK :BNRF@B0 \$-+ " -+-, S`V -+-+' dWebWUf[hW^k%	S`V " aX fZW 9a_bS`k	se Ua`ea^[VSfWV dWhW`gWe	e [`fZW fZdWW _a`fZe W`VW	V IWbfW_TWd .+'

$\label{lem:condition} $JZW Xa^a i [`Y fST^W eg\_\_Sd[1We ShWdSYW VS[^k Ua`eg_Wd egTeU-+-+ Xad eW^WUf bgT^[USf[a`e S`V Xad S^ua`eg_Wd egTeUd[bf[a`ex]] $$ $$IV Xad S^u Ua`eg_Wd egTeUd[bf[a`ex]] $$$ $$IV Xad S^u Ua`eg_Wd egTeUd[bf[a`ex]] $$$$ $$IV Xad S^u Ua`eg_Wd egTeUd[bf[a`ex]] $$$$$ $$IV Xad S^u Ua`eg_Wd egTeUd[bf[a`ex]] $$$$$ $$IV Xad S^u Ua`eg_Wd egTeUd[bf[a`ex]] $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$		W _a`fZe W`V	WV IWbfW_TWd	+' -+-, S`V
	;_b dX	U dXbUU ]_^dXc	U^TUT HU`dU] RUb .	+ <sup>\$R%</sup>
	-+-,	-+-+	8XQ^WU	" 8XQ^WU
<pre>\$[`fZageS`Ve'WjUWbf "%</pre>			7 UddUb*S	<b>L_bc</b> U%
AMJ DFQQ @YWJJY 8TZWSFQ				
: $[Y[fS^{a}^{a}] = gTeUd[bf[a]^{U}]$	- '3+.			

 $+\textit{KKG 8Q?HF0EFJD}\$-- \text{ "aX fZW 9a\_bS`kse Ua`ea^[VSfWV dWhW`gWe [`TafZ fZW fZdWW \_a`fZe W`VWV IWbfW\_TWd .+'-+-, S`V-+-+\% fZeW fZdWW \_a`fZeW`VWV IWbfW\_TWd .+'-+-, S`V-+-+\% fZeW fZeWW f$ 

	;_b dXU dXbUU ]_^dXc U^TUT HU`dU ] RUb .+'			
	-+-,	-+-+	8XQ^WU	" 8XQ^WU
\$[`_[^[a`e'\yj\\bf "%			7 UddUb	*\$ L _bcU%
HWhW`gWe5				
9a`eg_Wd	! 0-/	! //,	! 3.	,4 "
EfZWd		,2	0	-4 "
I_dQ\ GUfU^eUc	0/1	/03	33	,4 "
EbWdSf[`Y Wj bW`eWe	\$.12%	\$.+/%	\$1.%	\$-,%"
I W^^[`Y' YW`WdS^ S`V SV_[`[efdSf[hW	\$4/%	\$3.%	\$,,%	\$,.%"
HUW ] U^d: 7>I96	! 30	! 2,	! ,/	-+ ''

 $< ad\ fZW\ fZdWW\ \_a`fZe\ W`VWV\ I\ WbfW\ \_TWd\ .+'\ -+-\ ,'\ dWhW`gWe\ Sf\ fZW\ 8\ aa]\ FgT^[eZ[`Y\ eWY\ \_W`f\ [`UdWSeWV\ !33a]\ FgT^[eZ[`Y\ eWY\ \_W`f\ ]$ 

 $Va^{S} G SYS[`ef^aUS^UgddW^U[We dWeg^fWV [`S dWhW`gW [`UdWSeW aX !-0 _[^{n}[a`'ad 0"'Xad fZW fZdWW _a`fZe W`VWV IWbfW_TWd .+'--, Se Ua_bSdWV fa fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+--,)]$ 

 $IWY\_W`f; 8?J: 7 Sf fZW DW i e CWV[S eWY\_W`f[\_bdahWV Tk !01\_[^{M}[a`Xad fZW fZdWW\_a`fZe W`VWV IWbfW\_TWd .+'-+-, Se Ua\_bSdWV fa fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+-,'bd[\_Sd[^k VgW fa Z[YZWd Ua`fd[Tgf[a`e Xda\_DW i e KA aX !-2\_[^{M}[a`S`V]]] Sf fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+-,'bd[\_Sd[^k VgW fa Z[YZWd Ua`fd[Tgf[a`e Xda\_DW i e KA aX !-2\_[^{M}[a`S`V]]] Sf fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+-,'bd[\_Sd[^k VgW fa Z[YZWd Ua`fd[Tgf[a`e Xda\_DW i e KA aX !-2\_[^{M}[a`S`V]]] Sf fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+-,'bd[\_Sd[^k VgW fa Z[YZWd Ua`fd[Tgf[a`e Xda\_DW i e KA aX !-2\_[^{M}[a`S`V]]] Sf fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+-,'bd[\_Sd[^k VgW fa Z[YZWd Ua`fd[Tgf[a`e Xda\_DW i e KA aX !-2\_[^{M}[a`S`V]]] Sf fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+--,'bd[\_Sd[^k VgW fa Z[YZWd Ua`fd[Tgf[a`e Xda\_DW i e KA aX !-2\_[^{M}[a`S`V]]] Sf fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+--,'bd[\_Sd[^k VgW fa Z[YZWd Ua`fd[Tgf[a`e Xda\_DW i e KA aX !-2\_[^{M}[a`S`V]]] Sf fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+---]]] Sf fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+----]]] Sf fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+------]]] Sf fZW UaddWeba`V[`Y bWd[aV aX X[eUS^--+------]]] Sf fZW Ua$ 

# 200QBN 8QN@E>0B0 KC . MQFPU : B@QNFPFB0

E` IWbfW\_TWd --' -+-,' fZW 9a\_bS`k S``ag`UWV S`W i efaU] dWbgdUZSeW bdaYdS\_ SgfZad[1[`Y fZW 9a\_bS`k fa bgdUZSeW gb fa !, T[^[a` [` fZW SYYdWYSfW aX [fe agfefS`V[`Y 9^See 7 9a\_\_a` IfaU] S`V 9^See 8 9a\_\_a` IfaU] \$fZW qHWbgdUZSeW FdaYdS\_r%) JZW HWbgdUZSeW FdaYdS\_ dWb^SUWe fZW 9a\_bS`kse !0++ \_[^a[a` 9^See 7 9a\_\_a` IfaU] dWbgdUZSeW bdaYdS\_ SbbdahWV Tk fZW 9a\_bS`kse 8aSdV aX : [dWUfade \$fZW q8aSdV aX : [dWUfader% [` CSk -+, .) JZW \_S``Wd' f[\_[`Y'`g\_TWd S`V eZSdW bd[UW aX S`k dWbgdUZSeWe i [^TW VWfWd\_[`WV Tk fZW 9a\_bS`k Sf [fe V[eUdWf[a` S`V i [^N VWbW`V gba` egUZ XSUfade Se fZW \_Sd]Wf bd[UW aX fZW efaU]' YW`WdS^\_Sd]Wf Ua`V[f[a`e' Sbb^(UST^W eWUgd[f[We ^S i e' S^fWd` Sf[hW [` hWef\_W`f abbadfg` [f[We S`V afZWd XSUfade) JZW HWbgdUZSeW FdaYdS\_ ZSe`a f[\_W^[\_[f S`V \_Sk TW \_aV[X[WV' egebW`VWV ad V[eUa`f[`gWV Sf S`k f[\_W)

 $JZW 9a_bS^k V[V \ af \ bgdUZSeW \ S^k \ aX \ [fe \ 9^See \ 7 \ 9a_a^i \ IfaU] \ ad \ 9^See \ 8 \ 9a_a^i \ IfaU] \ Vgd[Y \ fZW \ fZdWW \ a^fZe \ W^VWV \ IWbfW_TWd \ .+' \ -+- \ , \ S^V \ -+-+)$ 

- FRFABJA0

#### IQR\U V 8 ^dU^dc

#### ; $J \setminus X \mid TWU \mid OTWWT \setminus NSLX$

7 e aX IWbfW\_TWd .+' -+- ,' fZW 9 a \_bS`k ZSV Tadda i [`Ye aX !431 \_[ $^{\text{m}}$ [a`' i Z[UZ Ua`e[efWV aX fZW USddk[`Y hS^gW aX [fe -+- , IW`[ad DafWe)

#### 4T]YJQ 5 WTZU OTWW $T \ NSLX$

 $7e\ aX\ IWbfW\_TWd\ .+'\ -+-\ ,'\ fZW\ < aj\ fW^*\ : \ WTf = dagb\ ZSV\ \S[\%\ Tadda\ i\ ]\ Ye\ aX\ Sbbdaj\ [\_SfW^k\ !34+\_[^n[a`'\ ]\ Ug\ V]\ Yg\ Xg^^ VVdS\ i\ Va\ i\ aX\ [fe\ -+,4\ JWd\_BaS`\ <SU[^[fk'\ S\_ag`fe\ agfefS`V[`Y\ g`VWd\ fZW\ -+,4\ 9dWV[f\ <SU[^[fk\ S`V\ -+,2\ Mad][`Y\ 9Sb[fS^< <SU[^[fk'\ SVU]]\ Vg\ VWd\ fZW\ JW^efdS\ <SU[^[fk'\ SVU]]\ Yg\ VWd\ fZW\ JW^efdS\ SU[^[fk'\ SVU]]\ Yg\ Sb[fs^\ SU[^[fk'\ SU[^[fk'\ SVU]]]\ Yg\ Sb[fs^\ SU[^[fk'\ SU[^[fk'\ SVU]]]\ Yg\ Sb[fs^\ SU[^[fk'\ SVU]]\ Yg\ Sb[fs^\ SU[^[fk'\ SVU]]\ Yg\ Sb[fs^\ SU[^[fk'\ SVU]]\ Yg\ Sb[fs^\ SVU[^[fk'\ SVU]]\ Yg\ Sb[fs^\ SV$ 

?`  $SVV[f[a] fa fZ[dV(bSdfk [`VWTfWV`Wee' fZW < aj fW^ : WTf = dagb ZSe dW^SfWV bSdfk [`VWTfWV`Wee' [`U^gV[`Y 7!4++ _[^n[a] aX agfefS`V[`Y eZSdWZa^VWd ^aS`e S`V ShS[^ST^W XSU[^f[f[We Xda _ fZW 9a_bS`k) JZW eZSdWZa^VWd ^aS`e SUUdgW [`fWdWef Sf S hSd[ST^W dSfW aX fZW 7 gefdS^[S` 8 8 I O b^ge S` Sbb^[UST^W _SdY[` dS`Y[`Y Xda _ 1).+ " fa 2)20 " S`V _SfgdW [` : WUW_TWd -+-2) JZW eZSdWZa^VWd dWha^h[`Y UdWV[f XSU[^f[fk SUUdgWe [`fWdWef Sf S hSd[ST^W dSfW aX fZW 7 gefdS^[S` 8 8 I O b^ge S` Sbb^[UST^W _SdY[` dS`Y[`Y Xda _ -)++ " fa .)20 " 'VWbW`V[`Y a` fZW < aj fW^ : WTf = dagbse `Wf ^WhWdSYW dSf[a' S`V _SfgdWe [` @g^k -+-/) 7 VV[f[a`S^k' fZW < aj fW^ : WTf = dagb ZSe S` 7!,2+ _[^n[a` egTadV[`SfWV eZSdWZa^VWd ^aS` XSU[^f[k SYdWW_W`f i [fZ JW^efdS i Z[UZ US` TW geWV fa X[`S`UW UST^W fdS`e_[ee[a` Uaefe VgW fa JW^efdS) JZW JW^efdS < SU[^f[k SUUdgWe [`fWdWef Sf S hSd[ST^W dSfW aX fZW 7 gefdS^[S` 8 8 I O b^ge S` Sbb^[UST^W _SdY[` aX 2)20 " S`V _SfgdWe [` : WUW_TWd -+-2) JZW 9a_bS`k WjU^gVWe fZW gf[^1Sf[a` aX fZW JW^efdS < SU[^f[k Xda_ fZW IfSfW_W`fe aX 9SeZ <^a i e TWUSgeW [f e`a`(USeZ)$ 

#### ?3/5WTZUOTWWT\NSLX

7e aX IWbfW\_TWd .+' -+- ,' H; 7 =dagb ZSV \$[% Tadda i [`Ye aX Sbbdaj[\_SfW^k !-44 \_[^[a`' Ua`e[ef[`Y aX S\_ag`fe agfefS`V[`Y g`VWd [fe -+-- 9dWV[f <SU[^[fk \$Se VWX[`WV TW^a i %' S`V \$[[% 7 !, 32 \_[^[a` aX g`VdS i` Ua\_\_[f\_W`fe ShS[^ST^W g`VWd [fe -+-- 9dWV[f <SU[^[fk)]]]]]]

 $: gd[`Y fZW fZdWW \_a`fZe W`VWV IWbfW\_TWd .+'-+-,'H; 7 = dagb Ua\_b^WfWV S VWTf dWX[`S`U[`Y [` i Z[UZ [f dWbS[V S^S \_ag`fe agfefS`V[`Y g`VWd [fe -+-, 8d[VYW \SU[^[fk i [fZ fZW bdaU\WVVe \Xda_S`Wi 7!1++ _[^[a`g`e\WugdWV ek`V[USf\WV Ud\WV[f \SU[^[fk \$fZW q-+-- 9d\WV[f \SU[^[fk \$fZW q-+-- 9d\WV[f \SU[^[fk \$fZW q-+-- 9d\WV[f \SVU[^[fk \$fZW q-+-- 9d\WV[f \SVU]^[fk \$fZW q-+-- 9d\WV[f \SVU[^[fk \$fZW q-+-- 9d\WV[f \SVU[^[fk \$fZW q-+-- 9d\WV[f \SVU]^[fk \$fZW q-+--- 9d\WV[f \SVU]^[fk \$fZW q-+--- 9d\WV[f \SVU]^[fk \$fZW q-+--- 9d\WV[f \SVU]^[fk \$fZW q-+---- 9d\WV[f \SVU]^[fk \$fZW q-+----------------$ 

 $8 \ adda \ i \ [Ye g`VWd \ fZW -+-- 9 \ dWV[f \ XSU[^[fk p \ fdS`UZW , SUUdgW [`fWdWef Sf S \ dSfW aX \ fZW 7 gefdS^[S` 8 8 IO b^ge S \_SdY[` aX TWf i WW` ,)++ " S`V -),+ "'VWbW`V[`Y a` H; 7 = dagbse` Wf ^WhWdSYW dSf[a) 8 adda i [`Ye g`VWd fZW -+-- 9 \ dWV[f \ XSU[^[fk p \ fdS`UZW - SUUdgW [`fWdWef Sf S \ dSfW aX \ fZW 7 gefdS^[S` 8 8 IO b^ge S \_SdY[` aX TWf i WW` ,),0 " S`V -)-0 "'VWbW`V[`Y a` H; 7 = dagbse` Wf ^WhWdSYW dSf[a) 8 afZ \ fdS`UZWe USddk S Ua \_ [f _ W`f \ XWW aX /+ " aX \ fZW Sbb^[UST^W _SdY[` a` S`k g`VdS i` TS^S`UW)$ 

 $JZW -+-- 9 dWV[f < SU[^{fk} dWcg[dWe H; 7 = dagb fa _S[^fS[^ S[% S `Wf ^WhWdSYW dSf[a aX `af _adW fZS` .)0 fa ,)+ S`V $[[% S` [^fWdWef UahWdSYW dSf[a aX `af ^Wee fZS` .)+ fa ,)+)$ 

#### ; $J \setminus X \ 1 \ TWU \ ?J[TQ[NSL \ 1 \ WJINY \ 4FHNQNY^$

 $JZW 9a\_bS`k ZSe S`g`VdS i`!20+\_[^{[a]}g`eWUgdWV dWha^h[`Y UdWV[f XSU[^{[fk fZW q-+, 4 DW i e 9 adb 9 dWV[f < SU[^{[fkr\% fZSf US`TW geWV Xad YW`WdS^ UadbadSfW bgdbaeWe' i Z[UZ fWd_[`SfWe a`: WUW_TWd ,-'-+-/) }$ 

7<sup>M</sup> aX fZW 9a\_bS`kse Tadda i [`Ye Ua`fS[` Ugefa\_Sdk dWbdWeW`fSf[a`e' UahW`S`fe S`V WhW`fe aX VWXSg^f) JZW 9a\_bS`k i Se [` Ua\_b^[S`UW i [fZ S^ egUZ UahW`S`fe Sf I WbfW\_TWd .+' -+-,)

IWW DafW 1 p 8 adda i [`Ye [` fZW SUUa\_bS`k[`Y 9a`ea^[VSfWV <[`S`U[S^ IfSfW\_W`fe Xad XgdfZWd VWfS[^e dWYSdV[`Y fZW 9a\_bS`kse agfefS`V[`Y VWTf' [`U^gV[`Y UWdfS[` [`Xad\_Sf[a` STagf [`fWdWef dSfWe S`V \_Sfgd[f[We dW^SfWV fa egUZ VWTf SddS`YW\_W`fe)

#### , KI I FP I BJPO

 $JZW \ 9 \ a\_bS`k \ ZSe \ Ua\_\_[f\_W`fe \ g`VWd \ UWdfS[` X[d\_ Ua`fdSUfgS^ SddS`YW\_W`fe \ qX[d\_ Ua\_\_[f\_W`fer\% fa\_S]W \ XgfgdW \ bSk\_W`fe)$   $JZWeW \ X[d\_ Ua\_\_[f\_W`fe \ eWUgdW \ fZW \ UgddW`f \ S`V \ XgfgdW \ d[YZfe \ fa \ hSd[age \ SeeWfe \ S`V \ eWdh[UWe \ fa \ TW \ geWV \ [` fZW `ad\_S^ UagdeW \ aX \ abWdSf[a`e) \ JZW \ 9 \ a\_bS`kse \ Ua\_\_[f\_W`fe \ Se \ aX \ IWbfW\_TWd \ .+' -+- \ , ZShW `af \ UZS`YWV \ e[Y`[X[US`f^k Xda\_ fZW \ V[eU^aegdWe \ [` U^gVWV \ [` fZW \ -+- \ , <ad\_ \ ,+(A) \ ]$ 

#### , KJPFJDBJ@FB0

 $JZW\ 9a\_bS`k\ dagf[`W^k\ [e\ ]`ha^hWV\ [`hSd[age\ ^WYS^hdaUWWV[`Ye'\ U^S[\_e\ S`V\ YahWd`\_W`fS^ [`ebWUf[a`e\ ad\ [`hWef[YSf[a`e'\ [`U^gV[`Y\ fZaeW\ V[eUgeeWV\ [`DafW\ ,+\ fa\ fZW\ 9a\_ea^[VSfWV<[`S`U[S^h\ IfsfW\_W`fe)\ JZW\ agfUa\_W\ aX\ fZWeW\ _SffWde\ S`V\ U^S[\_e\ [e\ egT\WUf\ fa\ e[Y`[X[US`f\ g`UWdfS[`fk'\ S`V\ fZW\ 9a\_bS`k\ aXfW`\ US``af\ bdWV[Uf\ i\ ZSf\ fZW\ WhW`fgS^agfUa\_W\ aX\ bW`V[`Y\ _SffWde\ i\ [^n\ TW\ ad\ fZW\ f[\_SfW\ dwea^gf[a`aX\ fZWeW\ _SffWde)<wwe'\ Wj\ bW`eWe'\ X[`We'\ bW`S^f[We'\ gVY\_W`fe\ ad\ eWff^w\_W`f\ Uaefe\ i\ Z[UZ\ _[YZf\ TW\ [`UgddWV\ Tk\ fZW\ 9a\_bS`k\ [`Ua``WUf[a`i\ [fZ\ fZW\ hSd[age\ bdaUWWV[`Ye\ Uag^V\ SVhWdeW^k\ SXXWUf\ [fe\ dWeg^fe\ aX\ abWdSf[a`e\ S`V\ X[`S`U[S^Ua^V[fa`)\ ]]) ]$ 

 $JZW\ 9a\_bS`k\ WefST^{e}ZWe\ S`\ SUUdgWV\ ^{ST[^{fk}\ Xad\ ^{WYS^}\ U^{S}[\_e\ i\ ZW`\ [f\ VWfWd\_[`We\ fZSf\ S\ ^{aee}\ [e\ TafZ\ bdaTST^W\ S`V\ fZW\ S\_ag`f\ aX\ fZW\ ^{aee}\ US`\ TW\ dWSea`ST^k\ Wef[\_SfWV)\ E`UW\ WefST^{e}ZWV'\ SUUdgS^e\ SdW\ SV\gefWV\ Xda\_f[\_W\ fa\ f[\_W\ f]\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ f]\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ f]\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ f]\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ f]\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ f]\ f]\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ fa\ f[\_W\ f]\ f]\ fa\ f[\_W\ fa\ f[\_W\ f]\ f]\ fa\ f[\_W\ f]\ f]\ fightw$ 

 $JZW\ 9a\_bS\ kse\ fSj\ dWfgd\ e\ SdW\ egT\ WUf\ fa\ a\ (Ya[\ Y\ dWh[\ wi\ S\ V\ WjS\_[\ Sf[a\ Tk\ hSd[age\ fSj\ SgfZad[f[\ we\ _Sk\ af\ SYdWW\ i\ [fZ\ fZW\ fdWSf\_\ W\ fa\ X[fW\_e\ dWbadfWV\ [\ fZW\ 9a\_bS\ kse\ fSj\ dWfgd\ e'\ S\ V\ fZWdWXadW\ fZW\ agfUa\_\ W\ aX\ fSj\ dWh[\ wi\ e\ S\ V\ WjS\_[\ Sf[a\ e\ US\ TW\ g\ bdWV[UfST^W)\ JZW\ 9a\_bS\ k\ TW^[WhWe\ [f\ ZSe\ Sbbdabd[SfW^k\ SUUdgWV\ Xad\ fZW\ Wj\ bWUfWV\ agfUa\_\ W\ aX\ g\ UWdfS[\ fSj\ _SffWde\ S\ V\ TW^[WhWe\ egUZ\ ^[ST[^f[We\ dWbdWeW\ f\ S\ dWSea\ ST^W\ bdah[e[a\ Xad\ fSjWe\ g^f[\_SfW^k\ Wj\ bWUfWV\ fa\ TW\ bS[V)\ >a\ i\ WhWd'\ fZWeW\ ^[ST[^f[We\ _Sk\ WWV\ fa\ TW\ SV\ gefWV\ Se\ `Wi\ [\ Xad\ _Sf[a\ TWUa\_We\ ]\ ai\ `S\ V\ Se\ fSj\ WjS\_[\ Sf[a\ e\ Ua\ f[\ gW\ fa\ bdaYdWee'\ ad\ Se\ eWff^W\ W\ fe\ ad\ ^[f]YSf[a\ e\ uu\ g]$ 

# H > < C6IJG:

 $FgdegS`f \ fa \ fZW \ dWcg[dW\_W`fe \ aX \ fZW \ IWUgd[f[We \ ; jUZS`YW \ 7 \ Uf \ aX \ ,4./' \ fZW \ dWY[efdS`f \ ZSe \ Vg^k \ USgeWV \ fZ[e \ dWbadf \ fa \ TW \ e[Y`WV \ a` [fe \ TWZS^X \ Tk \ fZW \ g`VWde[Y`WV \ fZWdWg`fa \ Vg^k \ SgfZad[IWV)$ 

D; MI 9EHFEH7 J?ED  $HWY[efdS^f]$ 

8k5 \*e\* IgeS` FS`gUU[a

I geS`FS`gUU[a 9Z[WX <[`S`U[S^ EXX[UWd

: SfW5 DahW\_TWd 0' -+-,