$\$ "eqpi tcwncvkqpu"\q'Mcvkg0Ko 'j crr { 'hqt dqyj ''qh''{qw''cpf 'Knqqm'hqty ctf '\q o ggvkpi ''y kyj ''dqyj ''qh''{qw0}

*tgrn{"Ungghqtf+

*Tkuc''/'Eco gmqu'Echg/'EQQ''NVIi 'RcwrlUrgghqtf''32<72+

 $\$ gm\$"Vtkr "uckf ."\$F qp)Vtwij "\q"s wkemi{."gplq{"\j g xcec\kqp"o qo gpwi'cpf "\j g"gpi ci go gpv j ki j 0P q"pggf "\q"dt\pi "qw\'\j g"uj q\i wpu0J cxg"{qw\j q\i j v'cdqw\'y j gp"{}cm'y km'dg"o cm\pi {qwt"cr r q\pvo gpv\\$

? I'? kỳn'lur gcm'\q''Mc\kg''cpf ''cttcpi g''c'\ko g'\q''eqo g cpf ''ugg''{ qw0Knpqy ''uj g'y cpvu'\q''o qxg''j gt uwkh'qp''dqctf ? I'?

\$Pq'twuj ''dwf.''lwuv'ngv'o g''npqy 'yjgp''{qw)xg'fgelfgf0\$

Ukwkpi "'y gtg'l\p''y g''uwp. ''Rowrl'eqwrf 'ko ci kpg''y g''eqphwukqp qp''y g''ecr vckpu''hceg. ''y qpf gtkpi ''kh y ku''y cu''c'') qrkf c $\{$ ''f $\acute{\Theta}$ cec \acute{V} kh

õY j cv'gxgt ''yj ku''kuAö

 $\label{thm:condition} $$\protect\ (\protect\ (\protec$

*T gr n{ ''cp{ +

 $Cu'uj \; g'y \; cmgf \; .'r \; cuulpi \; 'j \; qwt \; 'wr \; qp'j \; qwt \; 'u'pg'j \; qyt \; ''r \; cuulpf \; 'ah'cm'vj \; lpi \; u'c'hnqt kuv \; 'cpf 'j \; cf ''uvt wem'wr \; de land the contraction of the contraction$

õKo "uqtt{"Oktepfe0Uq"nqpi "cu"Kj exg"dtgeyj 000Ko uqtt{#ö

Uj g'y cvej gf 'hqt''y g'hqpi guv'vko g. 'y g'unqy 'tgvtgcvqh'y g'vkf g'vcnkpi 'j gt''qhhgtkpi 0'Uj g'j qr gf y ku''vko g'y cv'kv'y qwrf ''dg''ceegr vgf ''cpf ''uj g''eqwrf tguv'j gt''f kus wkgvgf ''uqwr0

õKøo "uq"uqtt{"Okok0"Krtqokug"Kfkfpøv"mpqy0ö

*Tgr n{ 'pqpg+

*Tkuc'/'Rtkxcvg'Dgcej 'j wi/'HQ'Eo ft'Ckn{pp'Dtcengp cpf'; F'o cpci gt'Eckx{'FwDqku/'2: 22+

Qr gplpi 'j gt 'g { gu. 'Eckv{ 'unt gvej gf 'cpf 'uo krgf 0'Vj g pki j v'j cf 'dggpí 0Co c| kpi 0T gcrkukpi uwf f gpn{ 'vj cv'uj g'y cu'gpvcpi rgf 'kp'Ckn{ pp. 'uj g'uo krgf . nkuugf 'j gt 'hqtgj gcf 'uqhxn{ 'cpf 'urqy n{ i qv'qw'qh'dgf 'kp'cp'ghqtv'pqv'vq'f kuvxtd'j gt0}

Rwnlpi "qp"c"f tguulpi "i qy p."uj g"y cpf gtgf "lpvq"yj g nksej gp"cpf "uo krgf "vq"j gtugrh"ci clp0 Qr gplpi "yj g"tghtki gtcvqt"f qqt."uj g"hqwpf "kv"vq"dg y gm"uvqenrgf 0'Rwnlpi "qw"uqo g"dceqp."gi i u cpf "o krm"uj g"hktgf "wr "yj g"i tkm"cpf "dgi cp"eqqnlpi uqo g"tcvj gt"ctqo cvke"dceqp."j wo o kpi "vq j gtugrh0

Ckn(pp"hgnv"j gtugrh"f tkhv"cy cng. "unqy n("uj cnkpi "qhh unggr)u"drkuuhwrlectguu0Cu"uj g"dgeco g unqy n("cy ctg"qh"j gt"uwttqwpf O O "cpf "dgi " {"pqpg+ Tgcrkukpi 'j qy 'cv'gcug'uj g'y cu. 'Eck\{ 'dgi cp'\q'ukpi 'cu'uj g'o cf g'\j g'dcwgt'hqt'\j g''dtgcmhcuv r cpecngu0Cu'uj g'hrkr r gf '\j g'hktuv'r cpecng. 'uj g'uvctvgf vq'f cpeg'kp'\j g''nksej gp0Ectghtgg'hqt yj g'hktuv'\ko g'kp'c'y j krg0

Uo krkpi "i gpvn(.'Ckn(pp'hgn/c'etgcwtg'qh'vy q''qrrqukpi rqrgu0J crh'qh'j gt''y cu'uq''wwgtn(eqpvgpv.''yj cv'uj g''eqwrf 'rkxg''yj ku''o qo gpv'hqt''yj g'tguvqh'j gt''rktg.''yj g''qyj gt''y cu''wwgtn('km'cv gcug.''yj g'y gki j v'qh'f gekukqp.''ci g/qrf 'r ckp''cpf 'tgi tgvy gki j gf 'f qy p''qp''j gt0'Uj g''i ki i rgf i gpvn(''vq''j gtugrh''cu''uj g''j gctf 'Eckx(''ukpi kpi ''cy c{ vq''j gtugrh'f qy p''kp''yj g''nkxej gp0'Urkr r kpi ''qw qh''dgf.''uj g''r wrrgf ''qp''c''ukrn'tqdg''yj cv'y cu''j cpi kpi wr ''qp''c''r gi ''d{ ''y g''dgf.''cpf ''kr vqgf ''vq''y g mkxej gp.''rgcpkpi ''qp''yj g''f qqthtco g''j qrf kpi ''dcem'c''i ki i rg cu''uj g'y cvej gf ''j gt''i ktrhtkgpf f cpekpi ''cpf ''ukpi kpi ''vq''j gtugrh''cu''uj g''r tgr ctgf ''y j cvuo grn'rkng''c''twn(''co c| kpi ''dtgcmhcux0'

Vwtpkpi 'cu'uj g'r w''y g'r cpecng''qp''y g'r revg. 'Eckv{ ucy 'Ckn{pp0J gt'heeg'hnwuj gf 'y kj go detteuuo gpv'eu'uj g'r cwugf . '\$000'{qw'j getf A\$

 \tilde{o} Rrgcug \tilde{o} qp ϕ v'uvqr "qp"o { "ceeqwpv \tilde{o} "uj g"uo krgf "j cr r kn(0)

Uo krkpi ."Eckx{ "hkpkuj gf "r rcvkpi "wr "vj g'hqqf "cpf "r rcegf ewwrgt { "pgzv'\q"dqvj "r rcvgu.""\$Rrgcug."ukv cpf "gcv(\$)\$

Y cvej kpi 'j gt'hqt'c''o qo gpv.'r ctv'qh'j gt'y qpf gtgf 'kh uj g'tgi tgwgf 'y j cv'j cf 'j cr r gpgf dgw ggp''y go 0Hzkpi 'c''uo krg''qp''j gt'hceg.''uj g''ucvcv''y g''cdrg''cpf 'r qwtgf ''uqo g''qtcpi g''lwleg0

õDcd{."vj ku"nqmu"co c| kpi ."{qw"f kf pøv"pggf "vq0ö"Ckn{pp uo krgf "cu"uj g"ucv"f qy p."r kemkpi "wr vj g"ewwrgt {"cpf "o qcpkpi "kp"cr r tgekcvkqp"cv"vj g"hktuvo qwj hwr0õO o o 0"Vj ku"ku"co c| kpi 0ö"uj g uo krgf ."nqqm{ uo krgO v"u#o o #

Ckn{pp"uo krgf "i gpvn{."eqxgtkpi "j gt"o qwj "cu"uj g"ej gy gf 0õQh"eqwtug"pqv."K ö"uj g"uy cmqy gf yj g"o qwj hwn'qh"dceqp"yj cv'uj gøf "i qv0õY gøxg"dggp uggkpi "gcej "qyj gt"hqt"o qpyj u."cpf "Kcf qtg cpf "ej gtkuj "gxgt { "o qo gpv'y kyj "{qw0Køu'yj g"pgzv'uvgr kp"qwt"tgrcvkqpuj kr 0Køo "pq"qpgu"qpg pki j v'uvcpf ."{qw'npqy "yj cv0ö

\$Kinpqy 0K)u'lww0'Kj cxgpøv'hgnv'y ku'y c{"cdqwcp{qpg"dghqtg"cpf."uq"j gnr "o g"kh"{qw'vgm cp{qpg."Ki gv'pgtxqwu0Ko "c"nkwrg"y qttkgf "y cv'pqy. {qw'y km'tgcnkug"y cv'{qw'eqwrf "f q"dgwgt0\$Uj g"tgrnkgf."nqqmkpi "cv'j gt"hqt"c"o qo gpv'cpf "y gp vcmkpi "c"i qqf "ukr "qh'y g"qtcpi g"lwkeg0

\$Ki)u'uectg{."dwi'uq'j grr 'o g'Kjf 'tcvj gt'hki j v'cpqvj gt Rcj 'Y tckj ''vj cp'j wtv'{qw0[qw'ctg''vj g''qpn{ r gtuqp''vj cv''wpf gtuvcpf u'j qy ''xwrpgtcdrg''Kco ."{qw'rgxgncm'qh'o { ''pgwtqugu0O { ''j gctv'cej gu y j gp''{qw}tg''p''? ."cpf ''Kxgwrl'g OOO

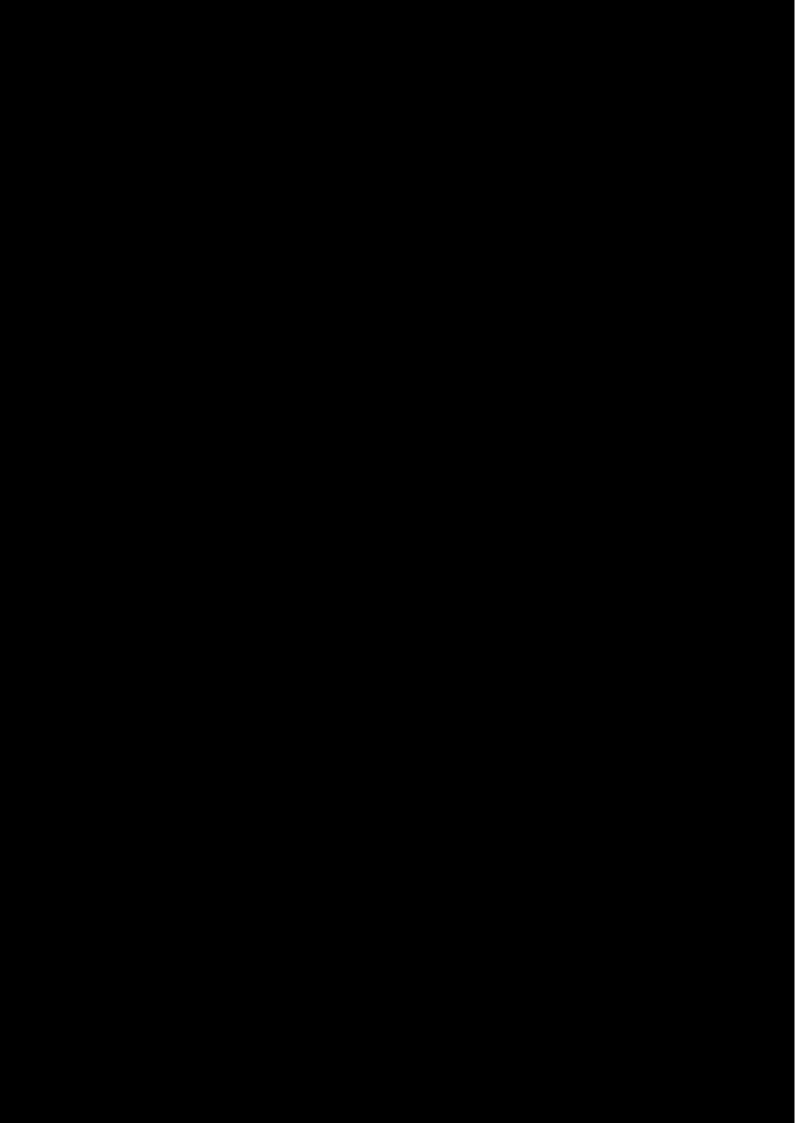
\$Ki qv'qp"cntki j v'y ky "F cng0\$"Eck\{ "tgr nkgf "cu'uj g"vqqni'c"hqtmhwn'qh'j gt"r cpecng0

 $\label{eq:control_control_control} \begin{tabular}{ll} \begin{ta$

Vj ku''ku''wtpkpi ''kpvq''c''o kuukqp''kup)/''kA\$''I tgvc''ncwi j gf

 $\label{eq:continuous} \begin{tabular}{l} \begin{t$

Rtgr ctgf 'hqt'uwej ''c'uvcvgo gpv.''qpn{ ''cu''y gm'cu''y qwucpf u qh'uwej ''s wguvlqpu''cpf ''tgvqtvu''ecp r tgr ctg''{ qw''y g''f ko kpwkxg''uj qr ''nggr gt''j cf ''cp''cpuy gt0õDgecwug''o { ''f gct.''{ qw''f qpø''j cxg y gug''r tqr tkgvct{ ''r cwgtpu''htqo ''ctqwpf ''y g''i cncz {0



 $$DqcA'Ki''j\ cv'y\ j\ cv'y\ kpi\ 'y\ cu'ecngf\ A$''Mgktc''cungf\ 0$KK' 'tcvj\ gt''j\ exg''cp''ctdqtgen'pggf\ rg\ upcng''ctqwpf''o\ \{'pgen'0$$

Ugpukpi "cp"qrrqtwpkk{."I tgvc"y gpv'hqt"k000Qj "{gcj. køxg"j gctf "qh"vj cv"qpg0Kdgrkgxg"vj gtg y cu"c"uvdf kxkukqp"ecngf "vj g"hgcvj gt"dqc"eqpuvtkevqt vqq00

\$Vj gtg)u'c'upcng'ecngf ''vj cv'\qqA\$''Vj g'Tqo wrcp'uckf. tckukpi ''qpg''g{gdtqy 0

Nqqmkpi "cv"gcej "qvj gt."I tgvc"cpf "Gtkp"f kuuqnxgf "kpvq ncwi j vgt0

\$Ko 'i ncf 'uqo gqpg'ku'co wugf (\$'Mgktc'uckf 0'Uj g'pqvkegf c'ugevkqp''qh'vj g'o gpw'ncdgmgf ceeguuqtkgu'y cu'eqxgtgf'y kij 'c'dki 'tgf '\$Z\$0\$Qj .'k\u00edu nkpg'k\u00edgo 'gf k\u00edcdm\u00ed\u00edg'\u00edUj g'r wuj gf 'ugxgtcn

 $$Texqm'j \ cu'uckf "j g''kmgu''o g''kp''i tggp."dgeewug''K'y qtg i tggp"qp''qwt''hktuv''f evg.$''uj g''cpuy gtgf 0 \\ $J \ g)u''cnuq''uckf "y j gp''K'y gct''dmem'kv''o emgu''o { "g{gu}} \\$

I tgvc'uki j gf 'j gcxkn(0'Vj g'tgcnkucvkqp''qh''y g'r reeg''y g{ 'j cf 'dggp''vq''y cu''y gki j kpi ''qp''j gt0'J gt o kpf 'j cf 'hqwi j v'pqv''vq''nqqm'cv''y g'f guki pu''cpf ''y kpmqh'y j cv'Ktg''y qwrf ''j cxg''y qwi j v'qh''f q''y cu''y gdv\$gvkf ''j ''w

\$I q0Kj cxg'vj kpi u'Kpggf'vq'fq'vq0\$'Uj g'uo krgf.'\$Y g uj qwrf'fq'vj ku'ci ckp'uqqp0Lwuv'pq'o gp vcmi'vj ku'vko g0\$
*Tgrn{"pqpg+
*Tkuc/"

 $\label{eq:continuous} Vj~g''j~quv'uj~twi~i~gf~0\~o[~qw@m'j~cxg''vq''cum'j~ko~'y~j~\{''j~g~r~tghgtu''qwt''guvcdrkuj~o~gpv''vq''yj~g''Vwt~vrg~Nqwpi~g0\~o$

õΥ

gpqwi j "\q"f q"uqo g"f co ci g"kh"j g"pggf gf "\q"vj tqy "kv"cv"emug"tcpi g0Rcm kpi "kv"j g"uo krgf "cpf ngr v'kv"kp"j ku"qhh"j cpf ."Iwuv"kp"ecug0



 $\label{eq:continuous} Gt kp"pqf f gf."\\ \~o Ecp"k"ngcxg"\\ \'y g"gs wkr o gpv'r tgr ctcvkqp"wr "vq" {qw'vj gp0Gpuki p'O kej cgnu."}$

 $F\$ kf "{qw'gxgt'i q'qp'cp{'qh'vj qug'gzr gf kkqpu'vj g{'tcp}\$}

 $P q'c'y g'cecf go {;}$;

;\$F_;

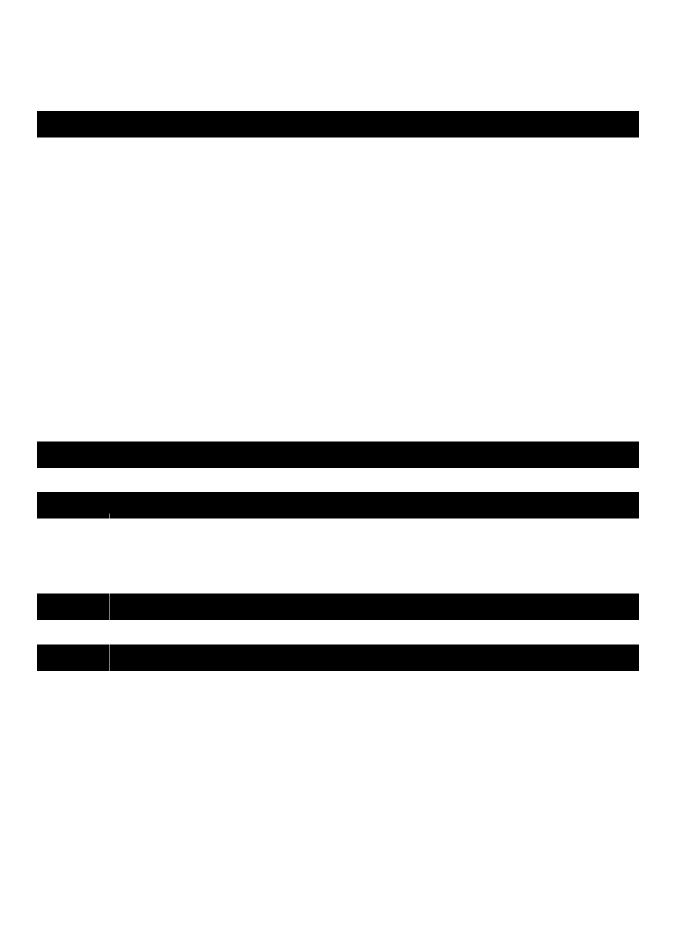
 $\$ i j v'uwtr tkug"{ qw'dw'Kecp"dg'c 'rkwrg'cy my ctf $0\$



Texqmlmqngf "cv'Cuj 0

\$"Mgktc"oc{"pqv'dg"jgt"oqvjgt".dwv'ujg"uwtg"jcu"jgtoqwj0\$"Jg"ncwijgf0Jg"npgy"Tc{pc
f lf p)v'o gcp'j gt'tgo ctm'vq'dg'twf g.''dw'tcyj gt''qdugtxcpvcpf ''cy ctg''qh'yj g'r quuldkrkv{ ''yj cv''Vtkr
oc{"kpfggf"eqwrf"dg"kp"rquuguukqp"qh"vjg"dcm0Tc{pcoc{"jcxg"dggp"{qwpi."dwv"jgt"Tqowncp
uegr wlekuo "cpf" jgt"qdlgewlxg"cpcn(wlecni'rtqdngo "uqnxkpi umkmu" ygtg"cntgc





õY j gtg'ctg'y g'i qkpi Aö'Uj g'cungf 0

\$"Ky cpv'\q'uy ko "kp"\j g"o qqprk\'Tkukcp"qegcp"."y kj yj g"o quv'dgcw\khwn'y qo cp"qp"\j g"gp\ktg r ncpg\0Fqgu'\j cv'o cng"o g"i tggf { A\$"J g"uo ktngf 0

 $\tilde{o}O$ c $\{dg'c''nkwrg.\ddot{o}''uj\ g''ej\ werngf.''vcmkpi\ ''j\ ku''j\ cpf\ 0$

*Tgrn{'pqpg+

*TkucóUwtc{c'Dc{'Tguqtv.''Y cvgtukf g'Dwpi crqy /'EQ.'Ecr vckp Vtkr 'Y kmkco u'cpf 'Fkt0T(UG Cuj ''Y kmkco u''42-22+

õK'y kpni'uj gou''curggr (b''Vtkr ''uckf ''y j kur gtkpi ''cu'j g gzksgf ''y g''uo cm'i wguv'tqqo ''kp''y g'tgpvgf dwpi cnqy (0 J g''rghv''y g'f qqt''urki j vn(''qr gp''uq'' j g'eqwrf j gct''kh''y gtg''y cu''cp{y kpi ''y tqpi (0 o'Nc{nc ku''kp''y gtg.''K'y kpni'Nc{nc''f gekf gf ''uj gof 'tcy gt''upwi i ng wr ''vq'Tc{pc''y gp''wu()

Vtkr ''yi gp''ucv''qp''yi g''eqwej ''pgzv''vq''Cuj 0

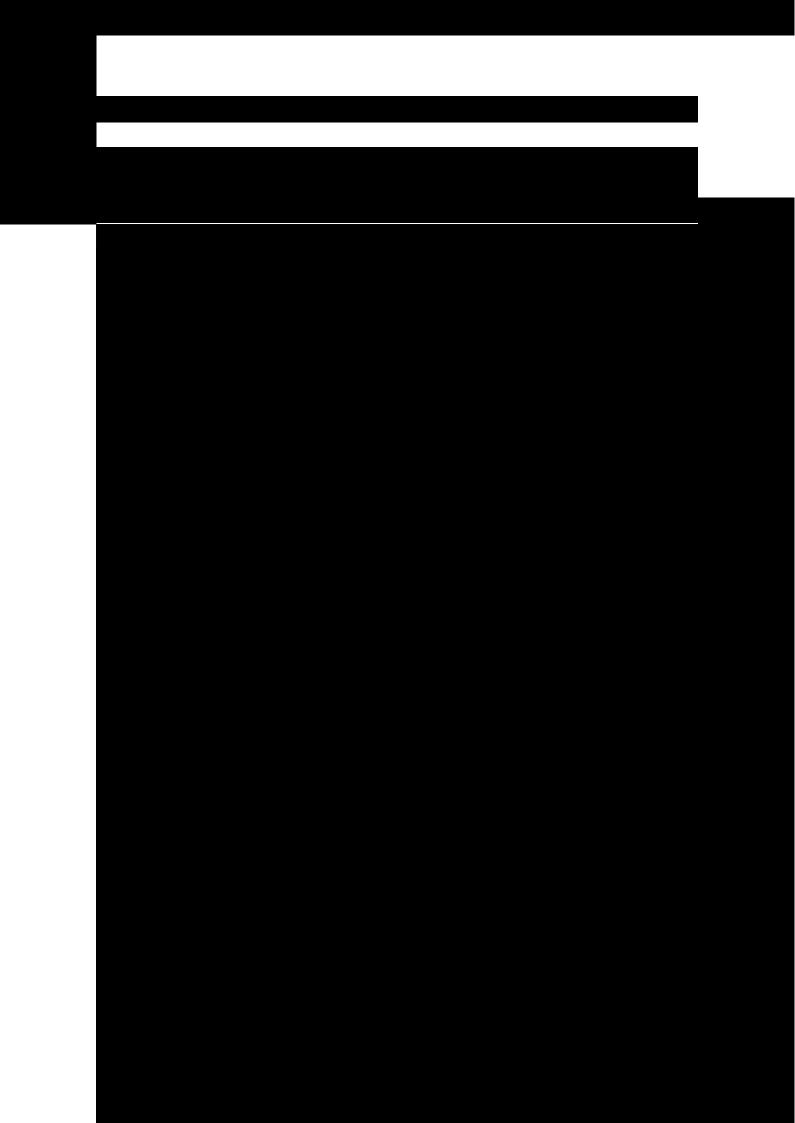
Cuj n(p'uo krgf 0ōKucy 0'Nkwrg'o cf co 0'Ukmö'uj g'uki j gf. ōkv'uj qy u''y cv'{qwt''f chv'f qi 'ecp''dg ctqwpf 'ej krf tgp0'Ky cu'y qttkgf 'cdqwv'y cv0ö

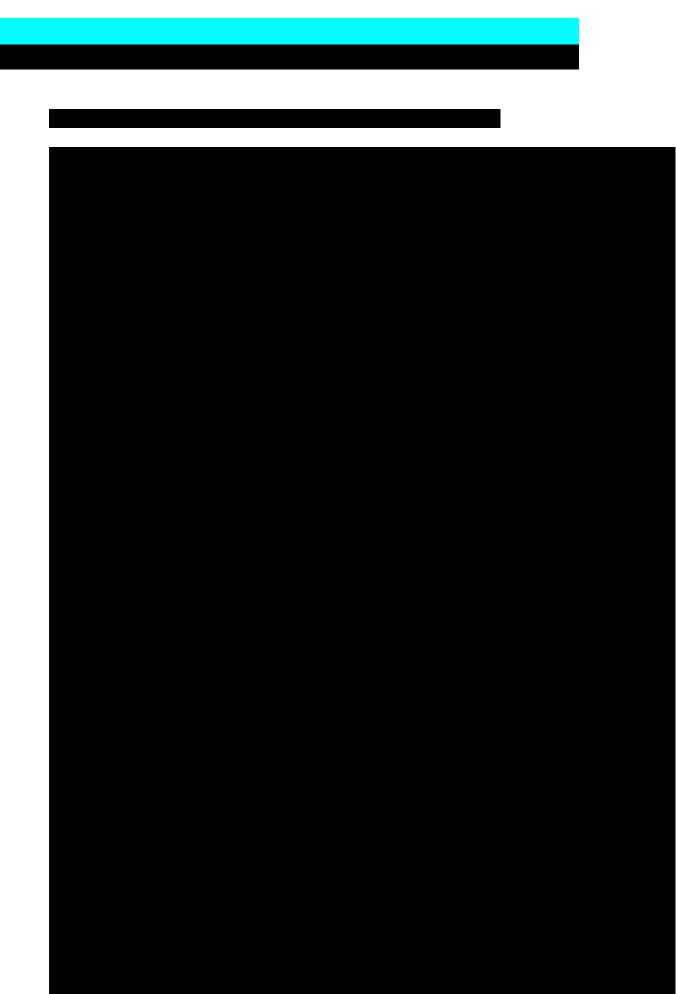
õKkj kpmluj g'lwuv'j cvgu'Vj gc@'Vtkr 'uckf 'y ky 'c'hcwi j 0

 $\tilde{o}I \ tcpvgf.''j \ g''f \ kf \ p\not o\! \tilde{v}''$

- ."c"<u>+</u>

tgk Ogtg"





Uo krlpi ''uqhxn(.''Gtlp''uj qqm'j gt'j gcf.'\\$Ky qtmgf'j ctf''dwx.''nqqmlpi ''dcem´ ''Kf qpøv'mpqy 0 Uelgpeg''ku''y j gtg''Khkx0'Ko ''j crr { ''j gtg0'Kgplq{ ''kx0Eqwpugmlpi ''K'y lpm'y cu''o { ''cwgo r v''q''t { cpf''j gm''r gqr ng''y g'y c{ ''Ky cu''j gm gf 0'K'y qpguxn(''y cpvgf vq''j gm ''r gqr ng0'K'y qtmgf''j ctf''dw



 $\label{eq:continuity} \begin{tabular}{ll} \b$

 $\$ cp. 'kh' Ko 'tgcf { 'uq''ctg'' { qw0} }

õKp''kugrh''xgt{''y gm0ô''uj g''dn
wj gf0ôY

Ow'wngcj 'K'Oo õ[qw'm

(6)

'**'K**w''g#

\$yj O z v0'



-tulof gu."{qwønn'lf q''i tgev'eu'e''f cf 0[qw'j cf 'e''i qqf 'hoo kn{'i tqy kpi 'wr ''yj cvøu'e''i qqf 'uvetv'qp''yj g dewng0ö
\$Ki wguu''y cv\u''y g'r qkpv\0'K\\u''j gcnyj {''vq''dg''chtckf 0Dw''{qw''j cxg''vq''j cxg''eqphkf gpeg''kp''y j q''{qw ctg0\$
õY cm'dcem'ö'uj g'cungf .''o qvkqpkpi 'vqy ctf 'V
\$Ki wgO &O O pv0K0µ'j gen.j {"vq'dg"chr0

*KMU'Xwt)vcm/'Ecrvckpøu'S wctvgtu'ó'Ej cøf Kej/'Gzgvgt''4Q1EGQ''ó''Nv0Eo ft

Tcxqm'uo krgf 0\$'O { 'o qvj gt'y km'dg'j gtg''uj qtvn('\$'j g'y cmgf ''qxgt''vq''yj g'eqwej ''y j gtg'Tc{pc y cu''ukwkpi ''vj gtg''r cvkgpvn(0

J g'mpgn/f qy p'dgukf g'j gt.'j gt'rkwrg'j cpf 'tgcej gf qw/cpf 'vqwej gf 'j ku'cto qt0

 $T j { '' q '' q w' h i j v' A}$

 $Texqni'y cu''cngp''cy c { 'hqt''c''o qo gpv'd { ''j gt''s wguvkqp0$''Uqo g'f q'kv'hqt''hwp.''uqo g''f q''kv'hqt i mt {0 Ko 'hki j vkpi 'hqt''i tepf o c''hqt''j gt''j qwug''hqt Mgktc''epf 'hqt''{qw0$}}$

Tc{pc'pqffgf'jgt'jgcf0

 π'' qw'y km'dg''uchg''y kj 'i tcpf o c''.yj gtg'y km'dg''qyj gtu yj gtg''\q''nggr''{ qw'uchg''cu''y gm'\$'Texqm eqpenwf gf ''cpf''j wi i gf''j gt0

 $_{J\ g''r\ k'O\ ''j\ qO}^{0}$

 $T \ cpf o \ c#\ cpc'' \ gmgf 'ej ggthwm 'cu'uj g'y tcrrgf j gt''cto u'ctqwpf 'Mqtc'u'pgen0Mqtc wtpgf 'cpf' \ hqngf 'cv' \ kg0$

uddindir inon in Yerke u."{qw'lww'nggr 'i gwkpi 'dgwgt nqqnkpi 'f qp)v'{qw'A\$

 $*Tgrn{"Kg"}+$

Mqtc'rcwi j gf 0\$'F qp)\'dg''o qf guv@b\'o cngu''{qw'gxgp o qtg''cwtce\kxg0\$'Uj g'i tlppgf 0

*'tgr n{ '**'K**g+

Texqm'dnwj gf 'cpf 'uj qqm'j ku'j gcf 0

\$'Cpf 'Eqo o cpf gt'O gtgn\$'Uj g'uo krgf 'cpf 'crrtqcej gf 'j gt. rrcekpi 'j gt'htgg'cto 'ctqwpf Mgktc'cpf 'us wgg| gf 'j gt0

\$\forall \display \text{different in the control of the control of

 ${^*\!Tgr}\,n\!\{\,{^t\!M\!gkt}\,c +$

\$'J qy 'y gmA'\$'Mqtc'rcwi j gf 'rqwf n('cpf 'too cengf 'Mgktc qp''y g'tij qwrf gt0

*'tgr n{ ''Mgktc+

Ucpf kpi "vj $\operatorname{gtg"kp"go}$ d
cttcuuo $\operatorname{gpv.}$ "Texqm'hgn
/j $\operatorname{ku'ht}$ wuvtevkqp dgi kppkpi "vq"
i $\operatorname{tqy} 0$

\$"Lww'nkng"{qwt 'hcy gt0Hlpg\$"uj g'nqqngf "cv'Ktg"\$"[qw'ecp"o cng"{qwt 'y c{ ''q''y g''dtkf i g'kh''{qw y cpv'. 'hggn'htgg'\q'nqm'cv'qwt 'hrki j v'u{uvgo u0\$

*'tgr n{ '**K**g''+

\$"Mgktc."Kco "f {kpi "\q"uj qy "{qw'qwt"pgy "y ctr "eqtg0Vj g"ghhekgpe{"tc\kpi "ku'\wr "d{"44"r gtegp\0}\$

*'tgrn{'Mgktc+

Mqtc'nqqngf "cv'Tcxqn0\$"Ncyi wgr0'o cng"{qwtugrh'cvj qo g'dw'dghqtg"{qw'f q'ectt { "gxgt {qpg}u yi kpi u''vq''yi g''ecti q''ctgc0\$

Tcxqm'erkpej gf 'j ku'hkuv0

\$"Pq#"Vj gkt"cto u'y qtm'llwuv'hkpg"qt"dgwgt"{gv'j cxg qpg"qh"{qwt"r gqr rg"fq"kx0"Y g"ctg"j gtg dgecwug"cr r ctgpvn{ 'pq"qpg'j gtg'ku'wr "\q'vj g"\cum'qh eqo r gwlpi 'kp'vj g'\qwtpco gpv0\$

Mqtc'uvgrrgf''vqyctf''j ko 0\$''Ncyj wgn'#\$

Texqn'ir qkpvgf 'vqy etf u'vj g''vtepur qtvgt 'qr gtevqt0\$ [qw.''eett { ''qwt ''uwkh''epf 'y j krg'' { qw}tg''ev'kx j exg''o { ''dev}rgyj ''uj etr gpgf 0\$

Vj g'mkpi qp''o cp''uvgr r gf 'htqo ''dgj kpf ''vj g''eqpuqrg0\$ Ky km'f q''pq''uvej ''vj kpi 000T qo wrcp\$''j g f genctgf ''y kyj ''c''upctn0

Mqtc'hqqngf 'cv'y g'gzej cpi g'uj qengf 'cv'j gt'uqp)u'dgj cxkqt

 $\label{eq:matching} \textbf{Mqtc'tckugf''j gt''j cpf''cpf''nqqngf''cv''y g'''tcpur qtvgt''qr gtcvqt}$

 $\| G \|_{L^{\infty}}$ gượ $\| G \|_{L^{\infty}}$ gườn "hạt "uạo g'f ki i kpi Aö

*Tgr n{ ''Y gcyj gtd{ +

$$\label{eq:continuity} \begin{split} & \|Q \|_{L^{\infty}(0,T)} \|Q$$

₹©tOO w#0 N′

Rkemkpi ''wr ''c''uj qxgn''Gtkp''f tqr r gf ''j gt''dci ''cpf ''uo krgf . õK00 ''kp''kv''y kyj ''{qw''i w{u0Fqy p''cpf f ktv{0!Ngvu1'i gv''q''kv00'

 $\Bar{o}'C\{g0Vj\ ku'\cngu'o\ g''dcem'\q''y\ j\ gp''Ky\ cu'c''y\ gg''dcktp0 \ U\cp''uckf$

*T gr n{ 'Gt kp. 'O kej cgnu'cpf 'Y gcyj gtd $\{+$

 $\label{thm:condition} \begin{tabular}{ll} Mqtc"y~cmgf~"ij~g"f~qqtu"qh"j~g"tcpur~qtvgt"tqqo~cpf~"i~tggvgf~"ij~g"cr~r~g"qh"j~gt~"g\{g0\$"O~\{rkwg"r~tkpeguu"\$"Uj~g"f~genctgf~"cupf~\$O~O~Y~\end{tabular}$

 $\$ qr g"o { "uqp"ku"\tgc\pi "{ qw'y gm'A}

õQh'eqwtug''j g'ku0ö''

Tcxqmlenkpej gf 'j ku'hkuv0

Mqtc'uvgrrgf'vqyctf'j ko 0\$'Ncy wgn'#\$

Mgktc'y cvej gf 'vj g'vgpug'gzej cpi g'dgw ggp'Tcxqm'cpf

õQmc{0ò

J g'y cu'ucxgf "d{ "Mqtc"o qxkpi "qxgt"\q'\cmi\q'O gtgn0J g''o qxgf "\q'qpg"ukf g'nqqnkpi "ctqwpf y g'\tcpur qt\ygt"tqqo "\j kpnkpi "cdqw\'j qy "f khhgtgpv\j g'\Mrkpi qpu"f guki p''ewgu''eqo r ctgf "\q'\j g hgf gtc\kqp0J g''j gctf "Tcxqm\\cmkpi "\cmkpi "cdqw\'c \qwt"qh'\j g'\uj kr "cu''j g'tgwtpgf '\q'\j g eqpxgtuc\kqp0

\$'Lvuv'nkng"{qvt'hcyj gt0Hkpg\$

J g'ucy 'Mqtc'
iqqm'qxgt''cv'j ko $\boldsymbol{0}$

 $\label{thm:condition} $$ i qw'ecp'o cmg'' qwt'y c { ''q''y g''dtkfig''kh'' qw'y cpv.'hggn'htgg''vq''nqqm'cv'qwt''hrkij v'u { uvgo u0} $$$

J g'uo kngf 0

õVj cv'y qwrf ''dg''i tgcv''y cpm'{ qw0o

Texqmienkpej gf 'j ku'hkuv0

Tcxqm'y cmgf "qpvq" yi g"dtkf i g".mqmkpi "ctqwpf "j g"ur qwgf yi g"vcevkecn'uvcvkqp" cpf "o cf g"j ku y c $\{$ "qxgt" vq"k0J ku"r cyj "y cu'ko o gf kcvgn $\{$ "dqengf "d $\{$ c"tcyj gt"ncti g"mkpi qp"o cng0 $\}$ "Y j cv"ctg $\{$ qw'f qkpi A\$"Vj g"mkpi qp"qhhkegt" upcr r gf 0

 $Texqm'' gepf'' q'' j ku't ki j v'epf'' ucy '' y g'' vev keen'f kur m \{\ tgef qw0$

 $\$ "iy g'ej kgh'\cevkecn'qhhkegt "qh'\y g'Gz gvgt0'Ko lww'ej gemkpi "qw'\{ qwt '\cevkecn'\uvc\kqp0\\$

 $\$ "cy'j cxg''pq''dwulpguu''nqqnl
pi ''cv'y cv $\$ g''nnlpi qp qlhlegt''i tqy ng
f0

Tcxqnllqqngf "ctqwpf "cv'yj g'mlpi qp'lcegu'lcwi j lpi

Mpggrkpi 'pgzv'vq'j gt

 $\mbox{\it o}$ G
puki p'O kej cgnı.'C''i gqmi kecn'xkgy r qkpv'r ngcug
06''Gtkp''uvcvgf .''j qnf kpi ''qwv'yi g''tkeqtf gt vqy ctf u''j gt
0

Lww'ij gp''y g'i tqwpf 'dgi cp''\q''uj cng0Gt\p''ecngf ''qw'\hqt''y go ''cm'\q'i gv'dcen0Cu'uqkt'dgi cp''\q hcm'cy c{ ''gzr qukpi 0'Y j cv'mqngf ''rkng''c''j wi g''j qng0Dw'uqo gyj kpi ''cdqw'kwu'uj cr g''o cf g''U\cp y qpf gt0

 $\tilde{o}''Vj$ gtg'ku'uqo gyi kpi ''qf f ''cdqww'yi g''uj cr g''qh''yi g''j qrg0 KV'rqqmu''o cp''o cf g''y j cv'f q''{ g''i w{u yi kpmA $\tilde{o}''U$ cp''cungf

*Tgrn{'Cml'Uekgpeg+

Gtkp"y cvej gf "j gt"vgco "uvgr "dcem'htqo "vj g"ukvg."uj g

 $\tilde{o} Uq. \text{"} \{ \text{guvgtf c} \{ \text{."} \text{y j gp'k'y cu'i cvj gtkpi ''uwr r nkgu'hqt''vj ku0'K'y cu'kp''vj g''o ckp''uj qr r kpi ''ctgc''cpf''K' } \}$

 $U_{\!\!J}$ g''o qxgf ''dgj l
pf ''Ucp''uq''uj g''eqwrf ''ugg''y j cv'j g''y cu

 $\label{eq:continuity} \mbox{6Y gm"ckp)'o {'lktuv'tqf gq0'Rnc{gf ''dcugdcm'kp''j ki j ''uej qqn'tgo go dgtA'Ecvej gt0'Cm''yj qug}} \mbox{6Y gm''ckp)'o {'lktuv'tqf gq0'Rnc{gf ''dcugdcm'kp''j ki j ''uej qqn'tgo go dgtA'Ecvej gt0'Cm''yj qug}} \mbox{6Y gm''ckp)'o {'lktuv'tqf gq0'Rnc{gf ''dcugdcm'kp''j ki j ''uej qqn'tgo go dgtA'Ecvej gt0'Cm''yj qug}} \mbox{6Y gm''ckp)'o {'lktuv'tqf gq0'Rnc{gf ''dcugdcm'kp''j ki j ''uej qqn'tgo go dgtA'Ecvej gt0'Cm''yj qug}} \mbox{6Y gm''ckp} \mbox{7Y gm''ckp} \mb$

$$\label{eq:continuous} \begin{split} &\tilde{o}Qvj\ gt"vj\ cp"Cuj\ ."Klwuv'f\ qpøv'tgcm("j\ cxg"cp{qpg"vq\ vcmt'vq0Uvkm'vt{kpi\ "vq"hki\ wtg"qwv'vj\ g}} \\ &eqwpugmqt"ukwevkqp"vqq0'Kvj\ kpmty\ g"pggf\ "vq"dtkpi\ kp"c"hgy\ "pgy\ "uvcht0'Køf\ "nkmg"vq"dtkpi\ "kp"c\ ekxkrtcp"eqp#OOOO$ \end{split}$$

 $\widetilde{o} Texqnfj\ cu'lwvfrqwpf\ ''qwv'j\ g''j\ cu''c''vy\ q''\{gct''qnf..'cpf\ 'ku''uvknfsp''s\ wkg''c''pgy\ ''tgrevkqpuj\ kr$

eqwr ng "o qtg "uguulqpu. "cnıq. "j gcf "qp "wr "\q "ulændc { . "{ qw'pggf "cp "cp \k/lphrco o c\qt { . "Kani'o cng "c tgs wguv."dw' Kao "pq\'rlægpugf "\q'f kur gpug0o

õI tgcv0ö'J g'uckf 'ukwkpi 'wr0õCp $\{$ 'rko kxcvkqpu'qp''y j cv Kecp''qt''ecpøv'f qAö

 $\mbox{\it \~oUvqr}$ "ej culpi "f $\mbox{\it qi}$ u"cpf "vqf $\mbox{\it f}$
rgtu A<code>\mathbox{\it \'o}'u</code>j g''ı ki i rgf <code>Q</code>g'uckf ''uko O O \$
rg`

$$\label{eq:control_on_signal} \begin{split} & \| \mathbf{K} + \mathbf{K} \| \mathbf{K} \|$$

 $\tilde{o} \textit{Knpqy} \text{ "uqo g"Hgf gtc-lqp"hcpi wci gu}\\ \tilde{o} \text{"Vj g"eqqn'lur qng}\\ 0 \tilde{o} \text{[qwt'r tqpwpelc-lqp"qh'Mrlpi qp'lur qng']}$

Vj gq'"'gq'"'gq''y pvg0'Mgwy vj j Mwy vj Mj

 $\label{eq:continuity} Vj~g"y~j~qng"tqqo~"dwtuv"qww"kpvq"cr~r~ncwug0Mg"g0"Mgwu"d0$

 $\label{eq:control_of_control} \begin{picture}(2000) \put(0.5) \put(0.5)$

 $\tilde{o}Rtqdcdn \hbox{\{.''}dw''y cwu''pqv''y g''tgcuqp''y j \hbox{\{}}$

F gur gtcvg'pqy

õΚκμι'pqv'lwuv'vj cvθ'Kvj kpm'uqo gvko gu'Kf qpκν'uj ctg.'dgecwug'Kf qp)v'hggrieqo hqtvcdrgθNkng'kκμι

\$Fjg{'\dd ''"\c{\\$FHOO"gq{\d'yjf.{™

 $Kf\ f''\ gcj\ 0Vj\ g\{''vpf\ gtuvqqf\ .''K'y\ kpm'qp''uqo\ g''pxgm'y\ cv''y\ g\{''y\ gtg''gzr\ gevkpi\ ''kv.''K'o\ gcp''kv''qqm\ 5''f\ c\{u''hqt''o\ g''vq''f\ gelf\ g''tki\ j\ vA$$

 $F \ f'' \ g \{'uc \{'y \ j \ q' \ g \ ugeq$

 $\ pq''pq.''$ Ko 'pqv.''dw'k)u'uqo u'''.''o ''o o wuPqPd

\$J qpguvn(A'K)o 'pqv'uwtg0'K)f 'dg'uwtr tkugf.''K'y kpmyj cv'kh''{qw.'y g.'f kf ''y gp''c'dkv'qh'wu''y cv'y g pggf ''q'uvc{ ''pxgngf 'y kn'lf kg0\$''Uj g'ucv'qp''y g''gf i g. cpf 'f cpi ngf ''j gt''ngi u''kpvq''y g''y cvgt0

Fq'' qw' gxgt'' y kpm' cdqw' T gng A

Uj g'uki j gf "cpf "j gt "vqpg"dgeco g''s wkgv. 'tghrgevkxg. cpf "tgi tgvhwr0"\$C m'yj g''vko g0'K'yj kpm'qh''j ku i gpvrg"o cppgt "kp"o { 'y cmkpi 'f c{

Dkm{ 'hrwi j gf 0'õCneqj qn0ò

Ncpc'uo krgf .''õuqwpf u'rkng''yi g'uvct v'qh'o quv'i qqf 'uvqt kgu0ö

 $\rm \tilde{o}Y$ gm'ngvăı'j qr g''yi ku''qpg''j cu''c''i qqf ''gpf kpi 06''J gkptkej uckf ''dgwy ggp''dksgu''qh''j ku''ucpf y kej 0'ŏK j cvg''uvqtkgu''y kyj ''nqwu{ ''gpf kpi u06'

 $\label{eq:continuity} \begin{tabular}{l} \begin{t$

*KMU'Xwt)vcm/'Ecrvckpø

 $\label{eq:control_state} J \ g''y \ cvej \ gf \ ''cu''y \ g''f \ qqt''q''y \ g''wtdqrkhv''qr \ gpgf \ ''cpf \ y \ cvej \ gf \ ''cu''Texqm''cpf \ ''Mgktc''gpvgtgf \ 0 \\ Texqm''y \ cmgf \ ''qxgt''q''y \ ko \ ''cpf \ ''r \ cuugf \ ''y \ g''Devørgy \ 0 J \ g''vqqm''y \ g''Devørgy \ ''hggrkpi \ ''ku$

 $\$ This j v'y g)tg'j gtg0Y g'uj qwrf 'o cng''qwt''y c{ ''qxgt

Mgktc"eqwrf "\gm'y g"cppqwpego gpv'wr ugv'Ncyi wgn'dghqtg"j g"uckf "cp{yi kpi 0'Vj g"\gpukpi "qh'j ku uj qwrf gtu."cpf "j ku'hceg"cpf "r quwtg"i cxg"j ko "cy c{0Mgktc"wtpgf "j gt"qy p"cwgpvkqp"\q"yi g gpvqwtci g"yi cv'y cu'o qxkpi "\q"yi g"uco g"f guvkpcvkqp yi g{"y gtg0Vj g"hgo cng"Mrkpi qp"y cu qdxkqwun{"yi g"hki j wgt."uj g"y cu'y kyi qww'egtgo qpkcnf ci i gt"cpf "j gt"eqo r cpkqp"y cu'ectt{kpi "c twi i gf "nqqnkpi "dcv)rgyi "eqo r rgvg"y kyi "c'ur kpcn'r cvkpg0

Kg'ki pqtgf ''y g'hgo cng''mkpi qp''cpf 'j gt''eqo r cpkqp''y j q nqqngf ''kng''y g''qpgu''y cv'Tcxqm'y cu i qkpi ''wr ''ci ckpuv''cpf ''nqqngf ''cv''y g'hcegu''qh''y g''qy gtu yi cv'y gtg''ctqwpf ''y g'tkpi ''vt { kpi ''vq''i gv yi g'hggrkpi ''qh''y g''Mrkpi qpu''y cv'y g)tg''j gtg''vq''y cvej 0

O cmkpi 'y got'y co po O

 $Lwuv'dghqtg''yj g''cppqwpego gpv'd\{''yj g''qvj gt''ukf g''Mgktc ngcpgf''kp''vq''y j kur gt''vq''Ncvj wgr0\$J g\{. \{qwt''qrrqpgpv'o guugf''wr 0'Vj g''j gcv''tgcvo gpv''qh''yj gkt \} .$