V@ā Áæk cækļ^Á, æv Áå[,} } [[æå^å Áå^ KÁŽKæ) å^} à[••&@ ÉÁT /ð*á U} KÁFFADE * * • AGEF€ OEB&^•• Áå^cæa‡• KÁOE&&^•• AÖ^cæa‡• KAŽĔ č à•&k j] cā[} Áj`{ à^¦Á/GÍÍIJHHÎ á Ú`à jā:@ ¦ÁVæô [[¦ÁBÁØ/æ) &ã Q.-{ ¦{ ædŠcå ÁÜ/^* ã: cº ¦^å Áş) ÁÔ} * jæ) å Áse) å ÁY æ}^• ÁÜ/^* ã: cº ¦^å Áp`{ à^¦KÁF€Ï GJÍI ÁÜ/^* ã: cº ¦^å Áţ, ~a&^ KÁT [¦cã[^¦ÁP[`•^ÉÁHÏ Ë IFÁT [¦cã[^¦ÁÙd^^cÉŠ[}å[] å[] ÁY FVÁHRPÉÁNS



Hc`V¶hY`h]g'5 fh]WYY`Xaa) å^}à[••&@ÊARÈAT ÈÉÂT ĚÉÁT ĚÉÁT ĚÉÓÉaa) åÁÓ`¦}@a‡ ÉÉVÉÄÜÈCCEF€DÁCÔ[{] ælä[}Á[-Á(^æo`¦^åÁç•ĚÁ, !^åå&o^åÁ]^¦{¦{æ}&^Á, Ákjā] or åÁ]æäj Á&[}&\or Á;æç^{^}or Á•ā]*Á@AT ^&@a) ã ælÊ(}] ã aBæahÁJæç^{{^}}or ði }ÁŐ`ãá^|ã]^ÓÉA Qoc'}ææā[}æhA[`¦}æhÁ[-Å]æç^{{^}orÔ}*ã]^^¦ã] ÉÉÁOã•OÁ,`à|ã @råÁ]}KÁF€ÁCE *`•ofOCEF€ÁÇÃOã•O Hc``]b_`hc`h.]g'5 fh]WYY.'8 C=`FEÈTEÌ EEFECIÌI HÎÈCEFELĚEÎÍĤ IF@`@d] H®åocÈá[āÈ;!*EFEÈTEÎ EEFECIÌI HÎÈCEFELĚEÎÍHÎ

ÚŠÒŒÙÒÁÙÔÜUŠŠÁÖUY ÞÁ⁄UÜÁŒÜV@ŠÒ

Ô|→→Á\æã↑bÁá^äÁ´~^ä⇔\↔~^bÁ~àÁ|bæİÁå*İĐĐ}}}È⇔^à~ã↑á}~ã→äÈ´~↑Đ\æã↑bËá^äË´~^ä⇔\↔~^bË~àËá´´æbbÈ*äà

Úå⇔bÁáã\↔´→æÁ↑á]ÁâæÁ|bæäÁà~ãÁãæbæáã´åÊÁ\æá´å⇔^&Áá^äÁ*ã⇔{á\æÁb\|ä]Á*|ã*~bæbÈÁN^]Áb|âb\á^\⇔á→Á~ãÁ b]b\æ↑á\↔´Áãæ*ã~ä|´\↔~^ÊÁãæËä⇔b\ã⇔â|\↔~^ÊÁãæËbæ`→∞^&ÊÁ→á^Á~ãÁb|âË→↔´æ^b⇔^&ÊÁb]b\æ↑á\↔´Áb|**→]Á~ãÁ ä⇔b\ã⇔â|\↔~^Á⇔^Áá^]Áà~ã↑Á\~Áá^]~^æÁ⇔bÁæ[*ãæbb→]Áà~ãâ⇔ääæ^È

򌾁*|â→vbåæãÁä~æbÁ^~\Á&⇔{æÁá^]Á}áããá^\]Áæ[*ãæbbÁ~ãÁ⇔t*→væäÁ~ãÁ↑á←æÁá^]Áãæ*ãæbæ^\á\⇔~^Á\åá\Á\åæÁ´~^\æ^\bÁ }↔→ÁâæÁ´~↑*→æ\æÁ~ãÁá´´∫ãá\æÁ~ãÁ|*Á\~Áäá\æÈÁÚåæÁá´´|ãá´]Á⇔^b\ã|´\↔~^bÊÁà~ã↑|→áæÁá^äÁää|&Áä~bæbÁ bå~|→äÁâæÁ⇔^äæ*æ^äæ^\→]Á{æã⇔à∞æäÁ}⇔\åá*ã⇔↑áã]Áb~|ã´æbÈÁÚåæÁ*|â→vbåæãÁbåá→→Á^~\ÁâæÁ→wáâ→æÁà~ãÁá^]Á→~bbÊÁ á´\⇔~^bÊÁ´→á⇔↑bÊÁ*ã~´ææä⇔^&bÊÁäæ↑á^äÁ~ãÁ´~b\bÁ~ãÅäá↑á&æbÁ}åá\b~æ{æãÁ~ãÁå~}b~æ{æãÁ´á|bæäÁáã⇔b⇔^&Áä⇔ãæ´\→]Á ~ãÁ⇔^ä⇔ãæ´\→]Á⇔^A´~^^æ´\⇔~^A}⇔\åá~ãAíã⇔b⇔^&Á~|\Á~àA\åæÁ|bæÁ~àA\å⇔bA↑á\æä⇔á→E



Eqo r ctkuqp"qh"o gcuwtgf "xu0r tgf kevgf "r gthqto cpeg"qh"lqkpvgf "r nckp"eqpetgvg"r cxgo gpvu"wukpi " y g'O gej cpkuvke"o"Go r ktkecn"Rcxgo gpv'F guki p"I wkf grkpg

LOO 0'Xcpf gpdquuej g^c, ."HOO w^clcpf "V0F0Dwtpj co^d

ã\↑æ^\Á~àÁO⇔{↔Áá^äÁÓ^{∻ã~^↑æ^\á→ÁÓ^&↔^æã↔^&ÊÁÛ+→{æãb↔\]Á~àÁŞ↔\\bâ|ã&åÊÁŞ↔\\bâ|ã&åÊÁŞNÊÁÛUNÌÁ^ªR↔^~æĎ~\áÁŒæ*áã\↑æ Úãá^b*~ã\á\↔~^ÊÁRá*→æ}~~äÊÁRSÊÁÛUN

*Tgegkxgf '3; 'Lcpwct { '422; = hkpcn'xgtukqp'tgegkxgf '4' Lwn { '4232D

Vj ku"tgugetej "gxenveyu" yj g" edktk{ "qh" yj g"O gej epknke" oʻ'Go r kteeri Rexgo gpv!" F guki p"I vkf g"*O GRF I +"vq" eewet vgn{"rtgf kev" y g" r gthqto epeg" qh'lqkpvgf "r nekp" eqpetgvg" r exgo gpvu" *IRERu+0' Vj ku" ku" eeeqo r nkij gf "d{" eqo r etkip i" rtgf kevgf "r gthqto epegu" y kj "qdugtxgf "r gthqto epegu" hqt "yj g" kp/ugtxkeg" o ekpikpg" vgnv" egmi" evi'O p ff QCF 0' Vj gug" eqo r etkuqpu" kpf kevg y i evi O GRF I " r gthqto epeg" rtgf kevkqpu" hqt "IRER" etg" o quv" eewet vg" y j gp" yj g" f ghevnv" *eqpuvepv+" dvknv/kp" gs vkx engpv" vgo r gt exwtg" f khtgt gpeg" qh"GÁ 707 î E "ku" wugf "kpuvgef "qh" e'ukg/f gr gpf gpv" xenvg0'K' e'r r getu" yi evi uki pktheepv" r qt kqpu" qh" yj g" gttqt" qh" guvb e vkqp" eep" edg" gzr nekpgf "d{" yj g" ugpukkkk{" qh" yj g" r gthqto epeg" o qf gmu" vq" xetkedktk{ "kp" j etf gpgf "eqpetgvg" r tqr gt vgu" o qf wnwu" qh" gt eqpthelepv" qt kqpu" qh" yi g" edgthtelepv" qt wt veg." o qf wnwu" qh" greunkek{ "cpf" eqpf kkqp+0' Rtgf kevkqpu" qh" und" etcenkpi " y gtg" hywpf " vq" dg" j kj j n{"ugpukkkg" vq" yj gug" r ecko gytu0' Kp" eff kkqp." yj g" O GRF I " etcenkpi " o qf gri uggo gf " pqv" vq" hkv" meen" etcenkpi " qdugt xevkqpu" htt" y g" O kppguq c" vguv' egmt0' P gy " ecrkdtevkqp" heevtu" etg" pggf gf " vq" o qtg" eeewet cvgn{" r tgf kev! O kppguq c" IRER" und" etcenkpi 0' Vj ku" uwef {" enq" keunvf" kp" eqnev fg" vj g" O GF RI "enq" rtgf kevgf " ugt xkeg" nksgu" hqt "y g" O pff QCF " vguv' egmu" wukpi "f kthgtgpy'f guki p" o gyi qf qni kgu" cpf "cu/dvknv" kpr wv" r etco gvgtu0' Kp" o quv' eeugu" eqpukf gt f." y g" O GFF I " rtgf kevf" mpi gt "ugtxkeg" nksgu" yi g" 3; ; 5" CCUI VQ" rtqegf wtg0' Vj g"O GF RI "enq" rtgf kevf" mpi gt "ugtxkeg" nksgu" hqt "y g"" greyf wtg" htg" greyf "dt" y g" 3; ; 5" CCUI VQ" rtqegf wtg0

 $Mg{y qtf u= OGRF I = dwhn/kp" yo r gtcwtg" f khgtgpeg= 'lqkpygf "r nckp" eqpetgyg" r cxgo gpv= etcenkpi = 'ugtxkeg" nkg= 'r gthqto cpeg" r tgf kevkqp$

Ko r gwu

Y j gp"c"pgy "r cxgo gpv"f guki p"r tqegf wtg"ku"kpvtqf wegf."kv"ku" ko r qtvcpv"vq"kf gpvkh{ "y g"kpr wu"y cv"uki pkhecpvn{ "kphnvgpeg" y g"f guki p"r tqegf wtg"qwr wu. "cpf "k/'ku"gs wcm{ "ko r qt vcpv''vq" gxcnxcvg" y g"cdkrkv{ "qh" y g"f guki p"r tqegf wtg" vq" ceewt cvgn{" rtgf kev" r cxgo gpv" r gthqto cpeg0' Vj g" qdlgevkxg" qh" y ku" tgugctej "y cu"vq"gxcnvcvg" y g"cdkrkv{ "qh" y g"O gej cpkuvke"ó" Go r ktkecn'' Rcxgo gpv''F guki p''I wkf g'' *O GRF I +'' *CTC.'' Kpe0' 4226+"xgt0'302"vq"rtgf kev'vj g"rgthqto cpeg"qh"lqkpvgf "rrckp" eqpetgyg" r cxgo gpvu" *IRERu+0' Vj ku" y cu" ceeqo r nkuj gf " d{" eqo r ctkpi " r tgf kevgf " r cxgo gpv" r gthqto cpeg" y kj " cewcn" r gthqto cpeg"o gcuwtgu"hqt"ugxgtcn"kp/ugtxkeg"r cxgo gpvu0'C" emug"mqmly cu"y gp"vcmgp"cv'y g"hcevqtu"y cv"o ki j v'tguwn/"kp" yjg" fkhigtgpeg" dgw ggp" yjg" rtgfkevgf" cpf" qdugtxgf" r gthqto cpegu."kg0'xctkcvkqp"qh"eqpetgvg"o cvgtkcn'r tqr gtvkgu" cpf " r cxgo gpv' uvtwewstg" f guki p" f gvcku0' Vj g" etcemkpi " r t
gf kevkqp" o qf gn' y cu" cnuq" gxcnxcvgf " hqt"
 mecn' O kppguqvc" eqpf kkqpu0

Vj g"gxcnwckqp" r tqeguu"hqt"cp{ "pgy "f guki p" r tqegf wtg" uj qwrf " cnıq" kpenwf g" eqo r ctkuqpu" qh" f guki pu" f gxgrqr gf " wukpi " ewttgpv" r tqegf wtgu" y kj " y qug" qdvckpgf " wukpi " y g" pgy " r tqegf wtg0' Vj ku" y cu" cnıq" ceeqo r rkuj gf " wpf gt" y ku" uwwf {0 Kpstqf weskqp

Vj g"O GRF I "ku"c"tgegpvn{"f gxgnqr gf "cpcn{uku"cpf "f guki p" vqqn' y cv' eqpukf gtu" hcevqtu" tgr tgugpvkpi "cm' qh'' y g" f guki p" kpr wu" eqpukf gtgf "kp" y g" Co gtkecp" Cuuqekcvkqp" qh'' Uccy" J ki j y c{" Vtcpur qtvcvkqp" Qthkekcnu" *CCUJ VQ+" 3;; 5" r cxgo gpv' f guki p"r tqegf wtg0' Ki' cnq" cwgo r u" vq" ceeqwpv." kp" c" xgt{" eqo r tgj gpukxg" o cppgt." hqt" uqo g" qh'' y g" ng{" o gej cpkuo u" yi cv'ctg" npqy p" vq"cthgev'r cxgo gpv'r gthqto / cpeg0' Vj g" qwr wu" qh'' yi g" pgy "r tqegf wtg" kpenvf g" yi g" r tgf kevgf "s wcpvkkgu" qh'' f kutguu" %Qg0' etcemkpi .." ur cmkpi "cpf" hcwnkpi +" cpf " tkf g" s wcrkv{" %Qg0' Kpvgtpcvkqpcn'' Tqwi j pguu" Kpf gz."KT KFhqt 'IRE Ru'r tgugpv'cv'cp {''i kxgp'vko g0

Qpg"qh" yj g" o quv" ko r qt vcpv" ko r tq xgo gpvu" kp" yj g" pgy " r tqegf vtg" ku" yj g" f ktgev" eqpukf gtcvkqp" qh" enko cvke" ghhgevu" *g0 0' yj g" f gxgmr o gpv" qh" vgo r gtcwtg" cpf " o qkuwtg" i tcf kgpvu" kp" eqpetgyg" r cxkpi " uncdu" cpf " yj gkt" ghhgevu" qp" r cxgo gpv" uvtguugu" cpf " f ghqto cvkqpu+." y j kej "ctg" o qf gmgf " wukpi " yj g" Gpj cpegf " kpvgi tcvgf " Enko cvke" O qf gm' *GKEO +." y j kej "j cu"dggp"kpeqtr qtcvgf "kp" yj g"O RGF I 0'Vj g"GKEO "ku" ecr cdng" qh" rtgf kevkpi " vgo r gtcwtg" eqpf kkqpu" yj tqwi j " yj g" f gr yj " qh" yj g" r cxgo gpv" uvtwewtg" *kQ0' kv" ku" c" qpg/ f ko gpukqpcn'o qf gm+'qp"cp'j qwtn{"dcuku0

ØUUSÁF€GÏËÎHĞIJÁ*ã↔^ÞØUUSÁFHÍÍËGIJÎVÁ~^→↔^æ ~ÁG€F€ÁÚá]→~ãÁBÁÔãá^ ↔b œŠØİÁF€ÈF€Î€ÐF€GÏÎHĞIJÈG€F€ÈI€IJIĞIJ <u>å*iĐĐ}}}È⇔^à~ã1á}~ã→äÈ ~↑</u> Vjg"ogej cpkuke"tgur qpug"qh" vjg"r cxgogpv" uvt we wetg" vq"

y g"køystcevkqp"dgw ggp"vtchke"]y j kej "ku"eqpulsf gtgf "wukpi " cewcn' czng" mcf "ur gevtc" cu" qr r qugf "vq" gs vkxcngpv" ukpi ng" czng" mcf u" *GUCNu+_" cpf "gpxktqpo gpvcn' mcf u" kp" y g" eqpvgzv' qh" y g" o cvgtkcn' cpf "uvtwewtcn' r tqr gt vgu" qh" y g" r cxgo gpv' ku" o cpci gf "d{"c" pgwtcn' pgy qtn' *P P+" y cv' ku" dcugf " qp" KUNCD4222" hkpkg" gngo gpv" o gy qf "cpcn{ugu" *Mj c| cpqxkej " gv' cn0' 4223+" cpf " ku" kpeqtr qtcvgf " kp" y g" O GRF I 0D{ "eqwr nkpi 'y g'' P "cpf "y g"GKEO .'y g'O GRF I " ku"cdng" q" cpcn{ug" y g" r gthqto cpeg" qh"r cxgo gpwu" qp" cp" kpetgo gpvcn' dcuku." vcmkpi " kpvq" ceeqwpv'' y g" f cvg" qh" eqput wekqp."f guki p"nkg"cpf "y g"ko g/dcugf "gxqnwkqp"qh" xctkqwu'f kutguugu.'uq'y cv'y g'f co ci g"ecwugf 'd{ "gcej "nqcf" ecp"dg'f gvgto kpgf 'kp"eqpukf gtcvkqp"qh'y g" vo g" qh" nqcf kpi 0

Kp"yj g"O GRF I "o qf gnu."vtcpuxgtug"etcemkpi "ku"gzr gevgf" vq"qeewt"f wg"vq"hcvki wg0'Vj g"vqvcn'etcemkpi "*r gt"egpv'urcdu" etcengf +" ku" qdvckpgf " d{ " cff kpi " r tgf kevgf " dqwqo /wr " cpf " vqr/fqy p" etcenkpi " tcvgu" cpf " uvdvtcevkpi " yj g" r tqdcdkrkv{" yj cv" dqyj " qeewt" kp" yj g" uco g" uncd0' Dqwqo /wr " vtcpuxgtug" etcenkpi " ecp" qeewt" y j gp" y gtg" gzkuvu" c" j ki j " r qukkxg" vgo r gtcwtg" i tcf kgpv" yi tqwi j " yi g" uncd" *k0g0' yi g" vqr " qh" yi g" urcd" ku" y cto gt" yj cp" yj g" dqwqo " qh" yj g" urcd+0' Wpf gt" yj ku" eqpf kkqp."tgr gcvgf "cr r necvkqpu"qh"j gcx { "czrg"nqcf u"tguww" kp" hcvki wg" f co ci g" cv" yi g" dqwqo " qh" yi g" uncd." y kyi " yi g" i tgcvguv" f co ci g" v{r kecm{ "dgkpi "f qpg" pgct" yj g" urcd" gf i g" enquguv" vq" yj g" crrnkgf " nqcfu0' Hqt" vqr/fqy p" vtcpuxgtug" etcemkpi ."yj g"hcvki wg"f co ci g"kpkkkcvgu"cv"yj g"vqr "qh"yj g"ured" f wg" vq" yj g" r tgugpeg" qh" c" pgi cvkxg" vgo r gtcwtg" i tcf kgpv" *Kg0'y g"vqr "qh'y g"uncd"ku"eqqngt "y cp"y g"dqwqo "qh'y g"uncd+" cpf "tgr gcvgf "j gcx { "czrg" nqcf u" cevkpi "uko wncpgqwun{ "qp" dqy "gpf u"qh'y g'urcd0

Cpqvj gt" r tko ct {" f kntguu" o qf gn" kp" y g" O GRF I " f guetklgu" y g" o gej cpkuo " qh' lqkpv' hcwnkpi 0' Eqpvtklwkpi " hcevqtu" kpenwf g<' tgr gcvgf " vtwen" czngu" etquukpi " vtcpuxgtug" lqkpvu." r qqt" lqkpv' mcf " vtcpuhgt" ghkekgpe {" *NVG+" cpf " y g" r tgugpeg"qh"hkpgu"cpf "htgg" o qkuwtg"wpf gt" y g"lqkpv0'NVG"ku" r tqxkf gf "d {" ci i tgi cvg"kpvgtmen"cmpi " y g"lqkpv." cu" y gm'cu" y g" uwr r qtv"qh" y g"dcug"cpf " y g"uj qwrf gt0'K'ecp"dg" i tgcvn{" ko r tqxgf "d {" y g" wug"qh' o gej cpkecn' f gxkegu" *gfl 0' vkg" dctu" cpf "f qy gn'dctu+0

Gxgt" ukpeg" ý g" dktý " qh" O GF RI ." ugpukkkk{" cpcn{ugu" j cxg" dggp" ecttkgf" qw" vq" f gvgto kpg" ý g" tgcuqpcdrgpguu" qh" ku" dwkn/kp" o qf gn" cu" y gm" cu" ý g" tgrcvkxg" ko r qtvcpeg" qt" ko r cev' qh" gcej " f guki p" kpr wr" *J cm" cpf " Dgco " 4226." Dctgpdgti " gv" cn' 4227." Eqtgg" 4227." Mcppgncpvk" cpf " J ctxg{ "4227."I wkgttg] "422: ."Mj c| cpqxkej "gv'cn'422: +0' Hqt"gzco r ng."I wkgttg] "*422: +'lk gpvkhgf "ý cv'ý g"dwkn/kp" gs wkxcrgpv'vgo r gtcwtg"f khtgtgpeg"cpf "ý g'Rqtvrcpf "ego gpv" eqpetgvg" *REE+" o qf wnw" qh" twr wtg" y gtg" ý g" o quv" kphwgpvkch' kpr wu" hqt" O GRF I " hcwnkpi " cpf " etcenhpi " o qf gn." tgurgeeg" qh' f qy gni" cpf " ý g" lqkpv' ur cekpi " ctg" etkkecn'*Mcppgncpvk"cpf "J ctxg{ "4227.0Vj g"eqpenwukqpu" qh" yj gug" uwaf kgu" ctg" ncti gn{" c"hwpevkqp" qh" yj g" v{ r gu" qh" uvcvkuvkecn"cpcn{ uku" wugf " vq" kf gpvkh{" vj g" etkskecn" kpr wu. " cu" y gm'cu' yj g" tcpi gu'qh" kpr wu'eqpukf gtgf " kp" vj g" cpcn{ ugu0

Vj g" O GRF I " ecp" dg" wugf" vq" rtgf kev! vtcpuxgtug" etcemkpi "*r gt" egpv! etcemgf "urcdu+." hcwnkpi ." NVG" cpf "tkf g" s wchk{ " *KT K!" hqt" IRER0' Vj g" rtgf kevkg" ecr cdkhk{ " qh" vj g" O GF RI " y kj " tgi ctf" vq" gcej " qh" vj gug" f kurtguugu" ku" gxcnwcvgf 0' Vq" ceeqo r nkuj " yj ku." pkpg" IRER" ugevkqpu" cv' vj g" O kppguqvc "Tqcf "Tgugctej "Hcekhk{ "*O p IT QCF +'y gtg" wugf " vq" eqo r ctg" o gcuwtgf "r gthqto cpeg" xu0' yj cv'r tgf kevgf "wukpi " vj g"O GRF I 0'Vj g" wug" qh'' yj g"r cxgo gpv" ugevkqpu" *guv' egmu+" eqpurt wevgf "cv'O p IT QCF "ku''kf gcn''kp" vj cv'ceewt cvg" cu/ dvknv" eqpurt wevkqp." o cvgtkcn' ej ctcevgt kucvkqp" cpf " tchhke" f cvc" ctg" cxckrcdng."cmpi " y kj "enko cvg" f cvc" htqo "cp" qp/ukg" y gcyj gt" uvcvkqp0' Gzvgpukxg" r cxgo gpv' r gthqto cpeg" f cvc" ctg" cmq" cxckrcdng'hqt"c"37/{gct'vko g"r gtkqf 0

Vgo r gtcwtg"cpf "o qkuwtg"i tcf kgpu"ecp"dg"r tgugpv"cv" y g"vko g"c"eqpetgyg"uncd"ugvu"wr 0'Vj gqtgykecm{."c"j ctf gpgf." kp/ugtxkeg" REE" uncd" ku" hncv" y j gp" vj g" vtcpukgpv" gs wkxcngpv" vgo r gtcwtg"f khigtgpeg"dgw ggp" y g"vqr "cpf "dqwqo "qh" y g" uncd" ku" gs wcn' vq" yj g" dwkn/kp" gs wkx cngpv'' vgo r gt cwt g" f khigtgpeg0' Cpqyj gt" wpks wg" cur gev' qh" yj g" O p ITQCF " wguv" egmu"ku"yj cv"yj g"dwkn/kp"gs wkxcngpv'vgo r gtcwtg"f khgtgpegu" dgw ggp"yj g"vqr u"cpf "dqwqo u"qh"yj g"urcdu"y gtg"guvcdrkuj gf " hqt" gcej " vguv" egm" kp" c" r tgxkqwu" uwwf { " *Xcpf gpdquuej g" 4225+0' Vj gug" xcnwgu" ctg" tghgttgf " vq" cu" dgkpi " ÷gs wkxcngp vø" vgo r gtcwtg" f khłgtgpegu" dgecwug." gxgp" vj qwi j " vj g" cewcn" vgorgtcwutg" cpf "oqkuvwutg" itcfkgpvu" ecp "dg" jkijn{" pqpnkpgct." yj g" pqpnkpgct" i tcf kgpvu" ecp" dg" gs vcvgf " vq" cp" gs wkxcngpv" nkpgct" i tcf kgpv" d{ " kf gpvkh{kpi " yj g" vgo r gtcwtg" fkhhgtgpeg" qt" nkpgct" i tcfkgpv' y cv' r tqf wegu" y g" uco g" fghrgevkqp" dcukp" *Lcpuugp" cpf " Up{fgt" 4222+0' Ugxgtcn' crrtqcej gu" hqt" f gvgto kokoi " y g" dwkn/ko" gs wkxcngov" vgo r gtcwtg" i tcf kgpv" ctg" tgr qtvgf " kp" vj g" nkvgtcwtg" *D{two "4222."Dgengo g{gt"gv"cn0'4224."Mj c| cpqxkej "cpf" [w'4227.'Tcq"cpf 'Tqgurgt '4227.'Y gm'gv'cr04228+0

Kt'uj qwrf "dg"pqvgf "vj cv''y g"O GRF I "dwkn/kp"gs wkxcrgpv" vgo r gtcwtg" i tcf kgpv' ceeqwpvu" hqt" y g" xctkcvkqp" kp" y g" vgo r gtcwtg"cpf "o qkuwtg"i tcf kgpvu"kp" y g"uncd"cv' y g" vko g" yj g" uned" ugvu" wr " cu" y gml cu" hqt" yj g" kttgxgtukdng" r ctv" qh" eqpetgyg" uj tkpmci g" qxgt" vko g." eqpetgyg" etggr " cpf " ugwrgo gpv" qh" yj g" dcug" cpf " uwdi tcf g" *[w" gv" cr0' 3; ; : ." Mj c| cpqxkej "gv"cn0'4223."I qvtkh"gv"cn0'4228+0'Ukpeg"yj gtg" y cu'pq hqto cn'r tqegf wtg hqt dcem/ecnewrcwpi uwg/ur gekhe" xcnwgu" hqt" yj ku" r ctco gygt" cv' yj g" vko g" qh" yj g" O GRF I " f gxgnqr o gpv. "kv'y cu"guvko cvgf "qp"c"i nqden'dcuku'f wtkpi "vj g" O GRF I "echdtcvkqp0'Vj g"dwkn/kp"gswkxcngpv"vgo r gtcwtg" i tcf kgpv." EV_{dvkn/kp}." y cu" cuuwo gf "vq" dg" yj g" uco g" hqt" cm" ugevkqpu"cpf "yj g'f ghcwn/'xcnwg"tgeqo o gpf gf "hqt "yj g"wugtu" kp"hwwtg"r cxgo gpv"f guki pu"y cu"ugrgevgf "cu"yj g"xcnwg"yj cv" o kpko kugf "f kuvtguu"r tgf kevkqp" gttqtu" *GÁ 707 ÎE+0' Gctrkgt" uwuf kgu'j cxg''uj qy p''y ku'xctkcdrg''vq''dg''et kkecn'vq''O GRF I " r cxgo gpv'r gthqto cpeg"r tgf levkqpu"*J cm"cpf "Dgco "4226." Dctgpdgti " gv" cn0' 4227." Eqtgg" 4227." Mcppgncpvk" cpf " J ctxg{ "4227." I wkgttg | "422: ." Mj c | cpqxkej "gv'cn 0422: +0

Vcdrg''30F guki p''qh'O p IF QV''vguv'ugevkqpu''vugf 'hqt "cpcn{ uku0

Vguv" ugevkqp	Egm	Uncd" yj kempguu" *o o +	Lqkpv" ur cekpi " *o +	Ncpg"y kf yj u." kpukf g kqwukf g" *o +	Fqygn" fkcogvgt" *oo+	Dcugluwddcug
7/[gct	7	3;2	803	6021605	47	: 2"0 0 "erfour "qxgt '8: 7"0 0 "erfour
	8	3:7	608	6021605	47	352"о о "енбиг
	9	3;7	803	6021605	47	322'o o 'RCUD'qxgt'': 2''o o "en6ur
	:	3;2	608	602 1602 1605	47	322"o o "RCUD"qxgt": 2"o o "en6ur
	;	3;7	608	602 1602 1605	47	322"o o "RCUD"qxgt": 2"o o "er6ur
32/[gct	32	477	803	5091509	54	322"о о "RCUD"qxgt": 2"о о "енбиг
-	33	462	905	5091509	54	352"o o "en7ur
	34	477	608	5091509	54	352"o o "en7ur
	35	472	803	5091509	5:	352"o o "en7ur

Vj gtghqtg." kv" ku ko r qtvcpv" vq" f gvgto kpg" y j gvj gt" vj g" o ci pkwf g"qh" y g"ukg/ur gekhe "xcnvg"qh" $\mathbb{E}V_{dvkn/kp}$ " ecp" dg" wugf "cu"cp" kpr wi kp" yj g"O GRF I 0

F guetkr vkqp"qh'O pfTQCF "vguv"egmu

OpfTQCF " ku" c" f gpugn{" kpuvt wo gpvgf " r cxgo gpv' vguv' hcekrkv{ "eqpurt wevgf "cf lcegpv' vq" Kpvgtuvcvg" Tqwvg"; 6" *K; 6+" crrtqzko cvgn{"87" mo "pqtvj y guv" qh" O kppgcr qnku." O kppg/ uqvc0'Vj ku"uwf { "wugf "r gthqto cpeg"f cvc"eqngevgf "htqo "yj g" pkpg"vguv"egmu" yj cv"eqpuvkwvg" yj g"7/"cpf "32/{gct"o ckprkpg" eqpetgvg"r cxgo gpv' vguv' ugevkqpu." y j kej "tgr tgugpv' f khgtgpv' eqo dkpcvkqpu" qh" urcd" y kenpguu." lqkpv' ur cekpi ." tguvtckpv' eqpf kkqpu"cpf "uwddcug" v{ r gu0'Vj g"urcd" y kenpguugu"qh" y g" $7/"cpf"32/\{gct"egmu"y~gtg"f~guki~pgf"vq"dg"3;~2"cpf"462"o~o~."$ tgur gevkxgn{0' Vj g" ngpi vj " qh' gcej " egm' ku" crrtqzko cvgn{" 3720 "cpf "cml'vguv'ugevkqpu"j cxg"cur j cnv"uj qwrf gtu0'Vj g"vguv" egmu" ctg" nqcf gf " d{" nkxg" ugtxkeg" vtchhke" yj cv' j cu' dggp" f kxgtvgf " htqo " yj g" tgi wrct" y guvdqwpf " rcpgu" qh" K; 60' Vj g" cppwcn'cxgtci g"f ckn{ "vtchhe"*CCF V+"ku"ewttgpvn{ "*kp"422; +" cdqwl'46.222"xgj kengu"r gt "f c{ "y kj "cdqwl'34" "j gcx{"xtwent" vtchhe0'Vjg"GUCNu"ceewo wrcvgf "uq"hct"ctg"crrtqzko cvgn{" 42"o kmkqp"ukpeg"yj g"eqpuvt wevkqp"qh'yj gug"ugevkqpu'kp"3; ; 60

Vcdrg"40Eqpetgvg"r tqr gtvlgu"qh"O p ITQCF "egmu0

Vcdrg"3"r tgugpvu" ý g"dcuke"f guki p"ej ctcevgt krvkeu" qh" ý g" O p ITQCF "vguv" egmt0'Vcdrg" 4"uj qy u"ý g"o gcuvtgf " r tqr gtvlgu" qh" ý g" j ctf gpgf "REE" vugf "kp" ý gug" vguv" egmt." cpf "Vcdrg" 5" r tqxkf gu" ý g" ci i tgi cvg" i tcf cvlqp" ur gekhec/ vlqpu"hqt" ý g"i tcpwrct"dcug"cpf "uvddcug"rc { gtu"vugf "kp" ý gug" vguv" egmu" *cu"r tqxkf gf "d {" ý g" 3; ; 7" O kppguqvc" F gr ctvo gpv" qh"Vtcpur qtvcvlqp "*O p IF QV+"Ur gekhecvlqp" Ucpf ctf u+0

Vj g" dwkn/kp" gs wkxcngpv" vgo r gtcwt g" f khgtgpegu" * $\mathbb{E}V_{dwkn/kp}$ +"hqt" vj g"O p ITQCF "r cxgo gpv" egmu" ctg" npqy p" vq"dg"gs wch'vq" gtq0Vj g"cewch'xcnwgu"qh' $\mathbb{E}V_{dwkn/kp}$ -hqt" vj gug" vguv" egmu" ctg" uki pkhlecpvn{" f khgtgpv" htqo " vj g" f ghcwn" *eqpuvcpv+'O GRF I "xcnwg"qh'GÁ707 îE' vj cv'y cu'cuuki pgf "vq" cm" uksgu" wugf" kp" vj g" etcemkpi " tgi tguukqp" o qf gn" ko r ngo gpvgf 'kp' vj g'O GRF I 0'Vj ku'r tqxkf gu'cp'qr r qtwpks{" vq" gxcnwcvg" r gthqto cpeg" r tgf kevkqpu" cv' $\mathbb{E}V_{dwkn/kp}$ " xcnwgu" qi gt" vj cp"GÁ707 îE "cpf "eqo r ctg" vj go "vq" y g" tgf kevkqpu" f gxgnqr gf "y j gp"wukpi ' $\mathbb{E}V_{dwkn/kp}$ " 0ÁGÁ707 îE0

Gxcnvcvkpi "etcemkpi "rtgf kevkqp

Vj g"O GRFI "y cu" wugf "vq" r tgf kev' vtcpuxgtug" etcemkpi "hqt" gcej "qh'y g"7/"cpf "32/{gct"o ckprkpg"vguv'egmu"cv'O p fTQCF " cv'c'ngxgriqh'tgrkcdkrkv{"qh'72' 0C''uwo o ct{"qh'y g'r tgf kevgf

Vguv" ugevkqp	Egm	O _a ÊÁ↑~ä → bÁ~àÁ ã *\ ãæÁ ÇGÎËäá]DÁ ÇRŞáD	G _o ÊÁ↑~ä → bÁ ~àÁæ→áb\↔´↔\]Á ÇGÎËäá]DÁ ÇRŞáD	EVG" *32°81ÎE+	ŒVdwwwpÊÁ *æã↑á^æ^\Á ´ ã→Đ}áã*Á æààæ´\⇔{æÁ \æ↑*æãá\ ãæÁ ä⇔ààæãæ^´æÁÇÎOD
7/[gct	7	605	47.722	: 03	GÁ203
	8	50,	53.722	: 03	2
	9	6	49.222	: 03	2
	:	507	53.222	:06	2
	;	50	4;.722	; 0	2
32/[gct	32	605	43.722	: 03	2
-	33	7	48.222	809	2
	34	608	4:.722	: 0	2
	35	609	49.722	: 0	2

Vcdng"50O p IF QV'3; ; 7"i tcpwrct"ur gekhecvkqpu"*r gt "egpv'r cuukpi +0

		Dcug'o cygtken								
Ukgxg'uk∤g	еıбur	eтбur	en7ur	RCUD						
5: 08"o o	ó	322	ó	ó						
53097"o o	ó	ó	ó	322						
4706''o o	ó	; 76322	322	;76322						
3;027"o o	ó	; 26322	; 26322	: 7ó; :						
3409"o o	322	ó	ó	ó						
;07/47"o o	; 76322	: 26; 7	92ó: 7	726:2						
P q06	: 76322	92ó: 7	77692	42672						
P q032	87ó; 2	77692	57677	2642						
P q042	ó	ó	ó	26:						
P q062	52672	37652	37652	267						
Pq0422	: 637	7632	5ó:	265						

S~\æbİÁU*æ´↔á→Á´ã|bå⇔^&Áãæ@|⇔ãæ↑æ^\bÁÇb*DÌÁ´→Ğb*Áá^äÁ´→Hb*İÁ´ã|båæäĐàãá´\|äæāÁ *áã\⇔´→æbÁáãæÁ^~\Áá→~}æàÌÁ´→Ib*İÁF€%FIÃÁ´ã|båæäĐàãá´\|ãæäÁ*áã\⇔´→æbÁáãæÁãæ|⇔ ŞNUÑÊÁ*æã↑æáâ→æÁáb*åá→∖Áb\áâ↔≫bæäÁâábæÈ

etcemkpi "hqt" gcej "qh" yj gug" twpu" ku" r tqxkf gf "kp" Vcdrg" 60' C" dguv/hkv" cpcn(uku" dgwy ggp" vjg" rtgfkevkqpu" cpf " vjg" qdugtxcvkqpu" ku" cnuq" ecttkgf" qwv." cu" uwo o ctkugf" kp" Vcdrg" 6." y j gtg" y g" urqr g" ko r rkgu" y g" tcvkq" qh" y g" o gcp" qdugtxcvkqp"vq"yjg"ogcp"rtgfkevkqp"cpf"yjg"T"4"kpfkecvgu" j qy 'y gm'y g'xctkcpeg''qh'y g'r tgf kevkqpu'hkv'y g'xctkcpeg''qh' y g'r gthqto cpeg0

Vj g"hktuv" O GRFI "twp" y cu" o cf g" wukpi " y g" o gcuwtgf " xcnwgu" hqt" $\mathbb{C}V_{dwkn/kp}$ " cpf " cu/ dwkn/" o cvgt kcn" r tqr gt vkgu" cpf " gpxktqpo gpvcnleqpf kkqpu0Vcdng'6'uj qy u'y cv'y g'tguwnkpi " r tgf kevkqpu"qh"uncd"etcemkpi "ctg"gzvtgo gn("f khhgtgpv"htqo" cewcn'qdugtxgf "tcvgu"qh"etcemkpi "hqt"cm"egmu"gzegr v"Egmu" 32"cpf "340'KV'ku"f khhkewnv'vq"f gvgto kpg"y j { "y g"O GRF I " etcemkpi "r tgf kevkqpu'y gtg'tgcuqpcdn{ "ceewtcvg'hqt "Egmu'32" cpf "34"dw/pqv/hqt "y g"qy gt "egmu"dgecwug "Egmu"32"cpf "34" f q"pqv"uj ctg"cp{ "eqo o qp"hcevqt "yj cv"ku"pqv"tgr tgugpvgf "kp" qy gt egm0

Dwkn/kp'vgo r gtcwtg'i tcf kgpv

Cpqyj gt"uwf { "kpf kecvgf "yj cv"kk"y cu"dguv"kh"yj g"kpr wv"xcnwg" $hqt" {\tt CV}_{dvkn/kp}" y \ cu" vtgcvgf" cu" c" eqpuvcpv" tcy \ gt" y \ cp" cu" c"$ xctkcdng"kpⁱⁱyj g"O GRF I "*Xcpf gpdquuej g"cpf "O w'422; +0" Vq'xcrkf cvg'y gug'hkpf kpi u. "c'ugeqpf 'ugtkgu'qh'O GRF I 'twpu" y gtg"o cfg"wukpi "y g"uco g"kpr wu"cu"y g"htuv"twp"gzegr v" wukpi "y g"O GRF I "f ghcwn
y"xcnwg"qh" $\mathbb{E}V_{dwhn/kp}$ "*GÁ 707 Î E+0" Vj g"tguwnu"qh"yj gug"cpcn{ugu"ctg"uwo o ctkugf "kp"Vcdng"6." y j kej "uj qy u'yj cv'yj g'O GRF I "r tgf kevkqpu"qh'uncd"etcemkpi " kortqxgf" i tgcvn{" hqt" cm' egmu." dw' y cv' y g{" y gtg" tgcuqpcdn{ "ceewtcvg" qpn{ "hqt" Egmu" 326340' Ki ecp "dg" pqvgf "vj cv' vj g"i tgcvguv'ko r tqxgo gpvu'kp"etcem'r tgf kevkqp" ceewtce{ "y gtg"qdugtxgf "hqt"y g"vguv"ugevkqpu"y ky "nqpi gt" lqkpv'ur cekpi u"*Egmu"7. "9. "33"cpf "35+0'Vj g"r tgf kevkqp"hqt" Egm"; "cnuq"ko r tqxgf "i tgcvn{."gxgp" y qwi j "kv" j cu"c" u j qtvgt" r cpgn'ngpi yi 0'Vj g"tguwnu"qh''yi gug"cpcn{ugu"uwi i guv''yi cv'kv" oc{ "dg"dgpghleken'vq"wug"y g"f ghewn/xenwg"hqt"EV

Table 4. MEPDG cracking analysis for Mn/ROAD mainline pavement test cells.				ăæäÌÁ					
Cell	5	9	7	8	6	10	11	12	13
Observed cracking, % slabs	15	0	0	0	0	0	6	0	0
Predicted cracking, % slabs									
Meas. built-in ^a and as-built conditions ^a ($\%$)	100	100	96	66	92	0	58	Э	98
Default built-in ^b and as-built conditions ^a ($\%$)	65	100	25	83	28	0	-	0	19
Default built-in ^b , $M_r = 4.3 \text{ MPa}$, $E_c = 27,600 \text{ MPa}$ and $\text{CTE} = 8.1 \times 10^{-6} \text{/}^{\circ}\text{C}$ (%)	84	89	6	1	1	0	86	0	48
Default built-in ^b $M_r = 4.7$ MPa, $E_c = 29,200$ MPa and CTE = 8.1×10^{-6} /°C (%)	65	74	4	1	0	0	67	0	20

ëUgg'Vcdrg'40' dcÁ707ÎE0



Hki wtg"30'Rtgf kevgf "IRER" uncd"etcenkpi "cu"c"hwpevkqp" qh' y g"tcvkq" qh' dqwqo /wr " fco ci g" vq" vqr/fqy p" fco ci g" hqt" xctkqwu" uncd" y kenpguugu0

kp'O GRF I "r tgf kevkqpu"gxgp"y j gp"y g"cewcn"xcnwg"ecp"dg" f gvgto kpgf 0' Vj g" y qtm' r gthqto gf " d{ " I wkgttg| " *422: +" uwr r qtwl'y ku'tgeqo o gpf cvkqp0

Vj g" hcev" vj cv" f
 getgcukpi " $\mathbb{C}V_{dvkn/kp}$ " htqo " c" o gcuwt
gf " xcnwg" qh" cdqwi' | gtq" vq" yj g" f ghcwnv" xcnwg" *GÁ 707 ÎE+" fgetgcugf " y g " rtgfkevgf " etcenkpi " uwi i guvu" y cv" y g" rtgfkevgf "hcknwtg" o qfg" ku" dqwqo /wr "hcvki wg" f co ci g" y j gp" y g" o gcuwtgf "xcnwgu" ctg" wugf 0'Y j gp" y g" f ghcwny" dwkn/kp" vgo r gtcwtg" f kthgtgpeg" ku" wugf ." kv" cr r gctu" vj cv" y kengt "r cxgo gpu"ctg"r tgf kevgf "vq"f gxgnr "o qtg"vqr/f qy p" etcemkpi."cu'uj qy p"kp"Hki wtg'3."y j kej "uwo o ctkugu'tguwnu" qdvckpgf "htqo "uqo g"qh"o qtg"yj cp"5222"O GRF I "twpu"yj cv" ctg"r ctv"qh"c"ugpukkxkv{ "cpcn{ uku"r gthqto gf "wpf gt"c"uwvf { " hqt"y g"Hgf gtch'J ki j y c{ "Cf o kpkrytcykqp"*Xcpf gpdquuej g" gv" cn0' 422: +0' J kuvqtkecm{." kv" j cu" dggp" cuuwo gf " y cv" r cxgo gpul'hcki'htqo "etcemu'kpkkcvkpi "cv'y g'dqwqo "qh'y g" urcd0J qy gxgt."y g'tguwnu'qh'y gug'uwf kgu'kpf kecvg'y cv'y g" o qf g"qh"etcembpi "r tgf kevgf "d{ "yj g"O GRF I "ecp"dg"f tkxgp" d{ "y g"ugrgevgf "xcnwg"qh'y g" EVdwhr/lp0 Dcugf "qp" y g"t guwnu" qh'y g''ewtt
gpv'cpcn{uku."kv'uggo u'y cv'y g''tq
rg''qh'' $\mathbb{E}V_{dwkn/p}$ 'kp'' y g"O GRF I "o c{ "dg"y cv"qh"c"echdtcvkqp"eqpuvcpv"tcy gt" y cp'y cv'qh'cp''cewcn'cu/dwhy'r tqr gtv{0

REE 'o cvgtkcn'r tqr gtvkgu

Vj g"uco g"REE"o kzwtg"f guki p"cpf "eqpetgvg"ci i tgi cvg" uqwteg" y gtg" wugf " vq" eqputvev" cm' qh" yj g" vgu" ugevkqpu0' Vj g" cxgtci g" 4: /f c{"Ot" y cu" 605" O Rc." y kj " c" uvcpf ctf " f gxkcvkqp"*UF +"qh"206" O Rc." tguvnkpi "kp"c" eqghhkekgpv"qh" xctkcvkqp"qh"3206' 0'Xctkcdkkk{ "kp"yj g"o gcuvtgf "uvtgpi yj u" ecp" dg" cvtkdwgf " vq" o cp{" uqvtegu." kpenvf kpi " pqto cn" xctkcdktkv{ "kp" vj g"r tqr gt vlgu"qh" vj g"o kzwtg"eqo r qpgpvu." r quukdrg"ugi tgi cvkqp"f vtkpi "vj g"eqpuvt vevkqp"r tqeguu."cpf " vgej pls vgu"wugf "f vtkpi "vj g"r tgr ctcvkqp"cpf "vguvkpi "qh" vj g" ur geko gpu0'KV v cu"cuuvo gf "hqt" vj ku"uvvf {"vj cv" vj g"cxgtci g" xcnvg"qh"cm"qh" vj g"o gcuvtgf "uvtgpi vj u"ku"tgr tgugpvcvkxg"qh" vj g" cxgtci g" uvtgpi vj " qh" vj g" eqpetgvg" vj tqwi j qw" gcej " ugevkqp="vj ku"xcnvg"%605"O Rc+"y cu"vugf "cu"c"uvctvkpi "r qkpv"kp" r tgf kevkpi "guvko cvgf "etcenkpi "vukpi "vj g"O GRF I 0

Vj g'Ge'y cu'49.822'O Rc'y kj 'c'UF 'qh'4; 22'O Rc'cpf 'c'' eqghhekgpt' qh' xctkcvkqp'' qh' 320'' 0' Vj g'' qxgtcm' cxgtci g'' xcnwg'qh'G_E''*49.822'O Rc+'y cu'ugrgevgf 'hqt'wug''cu'c'uvctvkpi '' r qkpv'kp''r tgf kevkpi ''etcemkpi ''kp''yj g''O p Π QCF ''egmu''wukpi '' y g''O GF RI 0

K'ku''kpvgtguvkpi ''vq''pqvg''y cv''y g''tgncvkqpuj kr ''dgw ggp''O t'' cpf ''G_E ''xctkgu''dgw ggp''y g''egmu0'Hqt ''gzco r ng. ''egmu''y kj '' j ki j gt'' O t'' xcnvgu'' qhgp'' r tgugpv'' nqy gt'' G_E '' xcnvgu0' Vj ku'' kmwntcvgu''y g''xctkcdktk{ ''qh'o gcuvtgf ''o cvgtkcn''r tqr gt vkgu'' *gur gekcm{ ''kp''y qug''y cv'uj qwrf ''dg''hpngf +'cpf ''go r j cukugu'' y g''pggf ''vq''vpf gtuvcpf ''y g''ugpukkxk{ ''qh'vguv'tguvnu''q''uvej '' npqy p''xctkcdktk{ 0

Vj g"cxgtci g"EVG"hqt"cm"yj g"egmu"y cu": (5"Ç'32^{G8}lÎE=" yj g" o gf kcp" xcnwg" y cu" : 03" Ç' 32^{G8}1ÎE0' Vj g" UF " y cu" 20 " Ç' 32^{G8}1ÎE." r tqf wekpi " c" eqghhekgpv" qh" xctkcvkqp" qh" ; 06' 0' Vj g" xctkcdkrkv{ "ku" urki j vn{ "rcti gt" vj cp" y j cv" y qwrf " i gpgtcm{ "dg" cpvkekr cvgf "hqt" y g" uco g" o kz "hqt" y ky kp/ncd" vguvkpi "dw" y qwrf "dg" i qqf "hqt "dgw ggp/rcd" tguwnu0' Hqtgpuke" gxcnvcvkqpu" qh" uqo g" eqtgu" htqo " y g" vguv" egmu" uj qy gf " ncti g" co qwpw" qh" ugi tgi cwqp0' Vj g" eqtgu" cnuq" uj qy gf " yj cv'' yj g'' vqvcn'' xqnvo g'' qh'' ci i tgi cvg'' r tgugpv'' crrgctgf "vq"xct { "dgw ggp"eqtgu0'Vj g"EVG"qh" y g"eqpetgvg" ecp" dg" guvko cvgf " d{" wukpi " y g" y gki j vgf " cxgtci g" qh" y g" eqpuxkwgpv"*Xg0'ci i tgi cvg"cpf "r cuvg+"dcugf "qp" y g"tgrcvkxg" xqnxo gu" qh" y g" eqpuxkwgpv" *Rcenctf " cpf " Vc { cdlk" 3; : 7+0" Dcugf "qp" y ku."ej cpi kpi "y g"eqpetgyg" ci i tgi cvg"eqpygpv"d{" 32' "ecp"tguwn/"kp"ej cpi gu"kp"y g"EVG"qh" "4"Ç'32^{G8}lÎE" hqt"y g"v(r g"qh"ci i tgi cvg"wugf "kp"y ku"r tqlgev0'Vj gug"hcevqtu" cm"j grr "vq"gzr rckp" y g"qdugtxgf "xctkcvkqp" kp" y g"o gcuwtgf " EVG"y j gp"y g"uco g"eqpetgyg"o kzwtg"f guki p"y cu"wugf "vq" eqpuxtwev'cm'qh''y g"egmt0'K'cnq"j grr u"gzr nckp"y j { "y g"EVG" qh"809"Ç'32^{G8}lÎE"o gcuwtgf "hqt" y g"eqtg"r wngf "htqo "Egm" 33"o ki j v'pqv'dg"tgr tgugpvcvkxg"qh"yj g"egm'cu"c"y j qrg0'KVku" dgrlgxgf " y cv" : 08" C' 32^{G8}1ÎE" dguv" tgr tgugpvu" y g" cxgtci g" EVG"hqt"cm'egmu"ukpeg"yi ku"xcnvg"ku"yi g"o gf kcp"cpf "y cu"yi g" cxgtci g"qdvckpgf "hqt "hqvt "qh'y g"pkpg"egmu0

Vj g"O GRF I "y cu"wugf "vq"r tgf levi'y g"urcd"etcenkpi "hqt" gcej "egni'wukpi "yj g"cxgtci g"O t"cpf "Ge"cpf "yj g"o gf lcp"EVG" qh"cmlegm='y g'tguwnu"ctg"r tqxkf gf "kp"Vcdng"60Vj gtg"y cu"c" uki pkhlecpv"ko r tqxgo gpv"kp"yj g"ceewtce{"qh"yj g"etcenkpi " r tgf levkqpu"hqt"Egmu'9"6"; ."cu"ku"cnq"kpf lecvgf "d{"c"i tgcvgt" unqr g"cpf "c"ncti gt"T"⁴"kp"Vcdng'70

Ki'ku"kpvgtguvkpi "vq"pqvg"yj cv'yj g"r tgf kevgf "urcd"etcenkpi " o gcuwtgu"hqt "Egmu": "cpf "; "ctg"uwduvcpvkcm{ "fkhlgtgpv"*. 5' " etcenkpi " xu0' 4: ' " etcenkpi +" y j gp" yj g" o gcuwtgf " REE" o cvgtkcn'r tqr gtvkgu'qh'gcej "egmiy gtg'wugf."gxgp'yj qwi j "yj g

Vcdng"/0Dguvhkvdgw ggp'r t	tgt kevkqpu'cpt	'qdugtxcvkqpu'hqt'	y g'ecugu't ghkpgt 1	p"Vcdrg'60
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	Uqr g"qh'\y g"hpgct"dgu\'hk\'dgw ggp" qdugtxc\lqpu"cpf "r tgf le\lqpu	T'ĞÁ~àÁ\åæÁ `↔ ^æáãÁâæb\Áà⇔\Áâæ\}ææ^Á ~âbæã{á\↔~^bÁá^äÁ*ãæä↔´\↔~^b
Ogcu0/dvkn/kpc"cpf "cu/dvkn/eqpf kkqpuf	2025	2024
F ghcwn/dwkn/kpd"cpf "cu/dwkn/eqpf kkqpu	2026	2023
Fghrwn/dwhn/kp ^d .'Ot" 'HÈĞÁRŞáÊÂĞE" 'GÍÊIJ€€ÁRŞáÂ á^äÁOÚÓÁ 'ÎÈFÁÇF€ ¹⁰ ĐÎO	202:	2065
Fghcwn/dwkn/kpd"Ot" "hÈÍÁRŞáÊÁGE" 'GÏÊG€€ÁRŞá á^äÁOÚÓÁ "ÎÈFÁÇF€≌ÐÎO	2083	2066

°"Ugg"Vcdrg"40

ď'GÁ707ÎE0

uvt wewtcrl'f guki pu"hqt" y gug" y q"egmı"ctg" xgt { "uko krct0'Vj ku" f khgtgpeg" kp" r tgf kevgf " etcemkpi " ecp" dg" cwtkdwgf " vq" y g" f khgtgpegu" kp" o gcuwtgf " Ot" cpf " GE" xcnwgu" hqt" y gug" kpf kxkf wcn'egmu"%k0g0'Egm', "eqtgu"gzj kdkwgf "j ki j gt"cxgtci g" Ot"cpf "my gt"GE"xcnwgu"y j gp"eqo r ctgf "vq"Egm!: +0'Y j gp" qxgtcmlcxgtci g'O_t"cpf "G_E"xcnwgu"y gtg"wugf ."y g"r tgf kevgf " etcemkpi 'y cu'3' 'hqt"dqy "egmu0

Eqpxgtugn{." yj g" etcenkpi " r tgf kevkqpu" hqt" Egmu" 7." 33" cpf "35" dgeco g" nguu" ceewtcvg" y j gp" yj g" r tqlgev" cxgtci g" O_t" cpf "G_E"xcnwgu'y gtg"wugf "cu"kpr wu"*tcy gt "y cp"egm'ur gekke" xcnwgu+0Hqt" yj gug"egmu. "yj g" O_t"o gcuwtgf 'hqt"gcej "egmly cu" j ki j gt" yj cp" yj g" r tqlgev" cxgtci g" O_t0' Wukpi " yj g" *ny gt+" cxgtci g" O_t"cu"cp" kpr wi'tguwngf "kp"c"uki pkhecpv'kpetgcug" kp" yj g" r tgf kevgf "etcenkpi ." gxgp" yj qwi j "nkwg" vq" pq" etcenkpi " j cu" dggp" qdugtxgf " kp" yj gug" egmu0' Kp" cff kkqp." yj g" EVG" o gcuwtgf "hqt" Egml 33" y cu" o wej "ny gt" yj cp" yj g" o gf kcp" xcnwg" f gygto kpgf 'hqt" cm'egmu. "uq" wukpi "yj g" o gf kcp" "y kj gt+" EVG" xcnwg" hqt" yj ku" egml cnuq" eqpvtkdwgf " vq" yj g" tguwnkpi " kpetgcug" kp"r tgf kevgf "etcenkpi 0

Vq" hwt ý gt" gxcnwcvg" ý g" ghhgevu" qh" xctkcdktk{ "kp" REE" o cvgtkcn' r tqr gt vlgu" qp" O GRF I /r tgf kevgf " etcemkpi ." cpq ý gt" ugv' qh" cpcn{ uku" twpu" y cu"r gthqto gf " wukpi "O $_{t}$ " cpf " G_E "kpr wu" ý cv'tgr tgugp vgf "r tqlgev'cxgtci g" xcnwgu" r nwu" qpg" UF "* Mg0'O t" 0 Å 6 09 'O Rc" cpf "Ge" 0 Å 4; 04 'I Rc +0'V j g'tguwnu" qh" ý gug" twpu" ctg" cnuq" r tqxkť gf " kp" Vcdrg" 60'C ný qwi j " ý ku" ej cpi g" j grr u" vq" ko r tqxg" ý g" ceewtce {" qh" ý g" etcemkpi " r tgf levkqpu'*cu'lpf lecvgf 'd{ "Vcdrg'7+"r tgf levgf "xcnwgu''ctg" uvkni'uvduvcpvkcm{ "j ki j gt" vj cp"qdugtxgf "xcnwgu''hqt"ugxgtcn' qh'vj g"egmt0

Vj g" tguwnu" qh" yj g" cpcn{ugu" cdqxg" uwi i guv" yj cv" yj g" o ckp" ghtgevu" cpf " kpygtcevkqp" ghtgevu" qh" REE " O₁. "G_E" cpf " EVG" qp" r tgf kevgf " urcd" etcemkpi " ctg" j ki j n{ "uki pkhkecpv0' Vj g" ugpukkkxk{ " qh" yj g" O GRF I " etcemkpi " r tgf kevkqp" vq" xctkcvkqpu" kp" yj gug" kpr wu" y cu" hwtyj gt" gxcnwcvgf " d{ " r gthqto kpi "cff kkkqpcn'twpu"qh"yj g"O GRF I "cu"f gvetkdgf " dgnqy 0'Vj g"r tgf kevgf "etcemkpi "qh"Egmi35"y cu"f gveto kpgf " tgr gcvgf n{ "y j kg"u{ ugo cvkecm{ "uwduvkwvkpi "yj g"o gcuwtgf " eqpetgvg"r tqr gtvgu"qh"Egmi33"hqt"yj qug"qh"Egmi35"kp"c"hwni hcevqtkcn'gzr gtko gpvcn'f guki p"r cwgtp. "cu"uj qy p"kp"Vcdmg'80' Vj g" ugxgp" uwduvkwvkqp" ecugu" eqpukf gtgf " ctg" mdgmgf "

Vj g"r tgf kevgf "r gtegpvci gu"qh"urcd"etcenkpi "hqt"ecugu"C" yi tqwi j "I "ctg"uj qy p."crapi "y kj "qdugtxgf "etcenkpi "f cvc." kp"Hki wtg"40'Vj ku"Hki wtg"uj qy u" yi cv' yi g"O GRF I "etcenkpi " r tgf kevkqp" hqt" ecug" I " *y j kej " wugu" O t." G_E" cpf " EVG" r tqr gtvkgu" htqo " Egm' 33+" o quv" erqugn(" o cvej gu" yj g" qdugtxgf "etcenkpi "f cvc0

Vj g"rcuv'eqnvo p"kp" Vcdrg" 8" uvo o ctkugu" ý g"r tgf kevgf" urcd" etcenkpi " hqt" gcej " ecug" chygt" 37" {gctu" qh' ugtxkeg0' Vcdrg" 8" cpf " Hki vtg" 4" uj qy " ý cv' ej cpi kpi " gcej " qh' ý g" eqpetgvg" uvtgpi ý " kpr vv' r ctco gvgtu" kpf kxkf vcm{ " *kg0' ecugu" C. 'D'cpf 'F +'f kf "pqv'tguvn/kp"ceewtcvg"r tgf kevkqpu'qh

Ved	m'8(NRt of kev	of "etcenk	ni "hat	t''Fom'35''h	າ t"່ອດາາຫາ" ໂຫ	mekni "RI	F'r tar otd	ou'ln'Eo	m'35'\v k	i ''vi ano''a) octaat of	"htt"Ford330
veu	ig ot	nuginuy	gi ciccin	pi iiqi	i Lginoo it	n cougu i gi	incerpt in	JLIUISUM	ցապր լեջ	шээум	յ ղ զաց զ	Jecumen	ingt Lgm550

		O t"		Qdugtxgf" etcenkpi "kp"{gct" 37"	Rtgfkevgf" etcemkpi "kp"{gct" 37"
Ecug	Ge'ÇRŞáD	ÇRŞÁD	EVG"*32 ^{G8} 1ÎE+	* "uncdu"etcengf +	* 'uncdu'etcengf +
Dcug	49.722	609	: 0		3; 02
С	48.222	609	: 0		3805
D	49.722	7	: 0		909
Е	48.222	7	: 0		604
F	49.722	609	809	202	404
G	48.222	609	809		20
Н	49.722	7	809		205
Ι	48.222	7	809		204

 $S^{a} = \hat{A} \otimes$



Hki wtg"40Rtgfkevkqp"qh'urcd"etcenkpi "qh'Egm'35"hqt"xctkqwu'REE" rtqrgtv{"kprwu0

qdugtxgf "urcd"etcenkpi ="ý g{ "cnuq"uj qy "ý cv"ý g"kpygtcevkqp" qh"cm"ý tgg"qh"ý gug"hcevqtu"eqpvtkdwgf "vq"ý g"eqpxgti gpeg" qh"r tgf kevgf "cpf "qdugtxgf "urcd"etcenkpi ."y ký "ecugu"H'cpf " I "r tqf wekpi "ý g"o quv"ceewtcvg"r tgf kevkqpu0'K/"ecp"cnuq"dg" pqvgf "ý cv" ej cpi kpi "ý g" EVG" r tqf wegf "ý g" i tgcvguv" ej cpi gu"kp"ý g"r tgf kevgf "tcvgu"qh"etcenkpi "y j krg"ej cpi kpi " ý g"O, "r tqf wegf "ý g"uo cmguv'ej cpi gu0

Hvt yj gt" kpuki j v" kpvq" yj g" ugpukkxkv{" qh" yj g" r tgf levgf" etcemkpi " vq" xctkcvkqpu" kp" r tqr gt vlgu" qh" yj g" j ctf gpgf " REE" ecp"dg"qdvckpgf "d{ "mqmkpi "cv" yj g" tgrcvkqpuj kr "dgw ggp" r gt" egpv" etcemkpi " cpf " f co ci g" yj cv" ku" wugf " kp" yj g" O GRF I ." y j lej "ku"f gr levgf "kp"Hki wtg"50'Vj ku"hki wtg"uj qy u"yj cv"uo cm" ej cpi gu" kp" f co ci g" ecp" uki pkhecpvn{" kpetgcug" qt" f getgcug" urcd" etcemkpi "kh" yj g" ceewo wrcvgf " f co ci g" ku" kp" ÷y g" etkkecn" | qpgø" *k0g0' ceewo wrcvgf "hcvki wg" f co ci g" dgw ggp" cdqw" 208" cpf " 3+0' Vj g" vqcn' co qwpv" qh" f co ci g" ecp" dg" uki gf " vq" yj g" nghv" qh" yj g" etkkecn"| qpg." yj gg" yj gg hgevu" qh"uo cm" ej cpi gu" kp" ceewo wrcvgf " f co ci g" f q" pqv" r tqf weg" uwej " uki pkhecpv" ej cpi gu" kp" urcd" etcemkpi 0' Vj ku" ecp" dg" ceeqo r nkuj gf " vq" xct { kpi " f gi tggu" d{" o cp{" o gcpu." kpenvf kpi <" *3+" d{" f getgcukpi " G_E" *y j kej " tgf wegu" urcd" utguugu+: *4+" d{" kpetgcukpi "O₄" *y j kej " f getgcugu" yj g" utguu" tcvkq" hqt" cp{"



Hki wtg" 50' Hcvki wg" f co ci g/urcd" etcemkpi " o qf g
n" wugf " kp" yj g" O GRF I0

cr r hgf " untguu+."*5+" d{ "f getgcukpi "EVG" *y j kej "tgf wegu" ewtnly ctr/tgrcvgf "untguugu+."*6+"d{ "kpetgcukpi "uncd" yi ken/ pguu"*y j kej "f getgcugu"nqcf/tgrcvgf "untguugu+."*7+"d{ "qy gt" f guki p" cpf " o cvgtkcm" o qf khecvkqpu." cpf " *8+" d{ " cp{ " eqo dkpcvkqp"qh" yi g"cdqxg0'Vj g"kpf kxkf wcn'cpf "eqo dkpgf " ghgew"qh'xct {kpi "yi g"htuv'yi tgg"hcevqtu"ctg"kmwntcvgf "kp" Vcdng'8'cpf "Hk wtg'4."y j kej "uj qy "lwvfj qy "f tcuvkecm{ 'yi g" qdugtxgf "uncd"etcemkpi "ecp"ej cpi g"*cpf "ecp"dg"htqo "yi g" dwg ggp" yi g"f guki pgf "r cxgo gpv"r ctco gvgtu"cpf " yi g"cu/" dwkn/r ctco gvgtu0

Ecnkdtcvkqp"qh"tcpuhgt"hwpevkqp

Hwtyj gt" kpuki j v' kpvq" vj g" ugpukskx kv{" qh" vj g" r tgf kevgf " urcd" etcemkpi "o qf gn'vq"xctkcvkqpu"kp" y g"REE"r tqr gtvkgu"ecp"dg" qdvckpgf "d{ tgeqpukf gtkpi "y g OGRFI tgrcvkqpuj kr " dgw ggp" ceewo wrcvgf " hcvki wg" f co ci g" cpf " urcd" etcemkpi ." y j kej "ku"uj qy p"kp"Hki wtg"50'Vj ku"hcvki wg"f co ci g/etcemkpi " r gthqto cpeg" ewtxg" y cu" ecrkdtcvgf " f wtkpi " y g" O GRF I " f gxgnqr o gpv" wukpi "f cvc" htqo "738" qdugtxcvkqpu" qdvckpgf " htqo " pgctn{" 422" IRER" ugevkqpu" mecvgf " y tqwi j qw" y g" WUC0' Kp" ur kg" qh" y ku" dtqcf " ecrkdtcvkqp" f cvcdcug." y g" pcvkqpcn'ecnkdtcvgf "ewtxg"f qgu"pqv'uggo "vq"hkv"f cvc"htqo "vj g" OpfTQCF "vguv"egmi."y j kej "uggo "vq"eqpukuvgpvn{ "qwr gt/ hqto "yjg"rtgfkevkqpu"qh"yjg"OGRFI/etcemkpi "oqfgn'cv" OpfTQCF."cu"kpfkecvgf"d{"Hki wtg"60'Eqpukfgtgf"cpqvjgt" y c{."y g"O p ITQCF/etcemkpi "f cvc"r qkpvu"y qwrf "dg"r rqwgf" vq"yjg"tki jv"qh"yjg"rgthqtocpeg"ewtxg"rtgugpvgf"kp"Hkiwtg"6." y j kng"pgctn{"cm' y g"ecnkdtcvkqp"f cvc"nkg"qp" y g"nghv' ukf g"qh" yj g"ewtxg0'Vj ku"uwi i guvu"yj cv"pgy "ecnkdtcvkqp"hcevqtu"uj qwnf " dg" guvcdrkuj gf " hqt" vj ku" o qf gri' vq" r tqxkf g" c" dgwgt" hkv" hqt" O kppguqvc "cr r nkecvkqpu"qh"yj g"o qf gn0

Vj g"etcenkpi "r tgf kevkqp"gs wcvkqp."guvcdrkuj gf "wukpi "yj g" r tgxkqwun{" f guetkdgf " pcvkqpcn" r gthqto cpeg" f cvc" *3+." ku" i kxgp"cu

Etcenkpi "0
$$\frac{322}{3$$
"xÁE6"Hcki wg^{E7}"L} ù3w

y j gtg'E6"0Á3"cpf 'E7"0ÁGÁ30 : 0Vj g'T'4"hqt 'vj ku'o qf grlku'' 20970

Dcugf " qp" ý g" r gthqto cpeg" f cvc" ewttgpvn{" cxckrcdrg" htqo " ý g" O pITQCF " vguv" egmu" ý g" rqecri' ecrkdtcvkqp" eqghhelgpvu"hqt" ý g"O pITQCF " uksgu" y qwff "dg"E6" 0Á 32⁷" cpf "E7" 0Á GÁ 320' Vj g"T "⁴"qh" ý g"hkwgf "ewtxg"ku"s wksg" rqy " *KQO' rguu" ý cp" 208+."kp" r ctv" f wg" vq" ý g" rcenti qh" etcenkpi " qdugtxgf '\q'f cvg"cpf "dgecwug"qh' ý g"hko ksgf "pwo dgt"qh'vguv" uksgu" cpf " cxckrcdrg" f cvO' Vj g" O pITQCF " vguv" ugevkqpu" uj qwff "dg"qh"i tgcv'xcnwg"kp"r gthqto kpi "c"rqecn'ecrkdtcvkqp" chgt"o qtg"f kwtguu"j cu'f gxgrqr gf 'kp" ý gug'ugevkqpu=hwt ý gt" f gxgrqr o gpv'qh'ý g"necn'ecrkdtcvkqp" eqghhelgpvu'uj qwf "dg" r wtuwgf 'cv'ý cv'vko g0



Observed cracking and predicted fatigue with average PCC properties

Observed cracking and predicted fatigue with average + one standard deviation PCC properties

Hki wtg'600 GRFI 'r gthqto cpeg"ewtxg'xu0iqecm{ "echdtcvgf 'r gthqto cpeg"ewtxg0

Rcxgo gpv'uvtwewtg

:

Vj g"ceewtce{"qh" yj g"O GRF I /r tgf kevgf "urcd"etcenkpi "y cu" gxcnxcvgf "y kj "tgur gev" vq" yj g" urtwewtcn" r ctco gygtu"qh" yj g" r cxgo gpv" dgkpi "cpcn{ugf 0' Qpg" qdugtxcvkqp" yj cv" j cu" dggp" o cf g" ku" yj cv" k" cr r gctu" yj g"O GRF I "vgpf u" vq" qxgtr tgf kev" vtcpuxgtug"etcenkpi "o qtg" htgs wgpv{" yj gp"c"i tcpwrct"dcug" ku" wugf " yj cp" y j gp" urcdkrkugf " dcugu" ctg" wugf " *Xcpf gp/" dquuej g"gv"cn0'422: +0'Cff kkqpcn'twpu"qh'yj g"O GRF I "y gtg" r gthqto gf " vq" hwt yj gt" gxcnwcvg" yj g" ugpukkkkk{" qh" yj g" O GRF I "vq" js g" qh"urcd" yj kenpguugu."uwddcug" v{ r gu" cpf " lqkpv" ur cekpi u" tgr tgugpvgf " kp" yj g" 7/" cpf " 32/{gct" o ckprkpg" egmu" cv" O p IT QCF 0' Gcej " twp" y cu" r gthqto gf " wukpi "kf gpvkecn'REE"o cvgtkcn"r tqr gt kgu"*O t"0Å 605"O Rc=" GE=0Å49.822"O Rc"cpf "E VG"0Å: 08"Ç'32^{G8}1fE+"kp"qtf gt"vq" kuqrcvg" yj g" ghtgevu" qh" yj g" ej cpi gu" kp" y g" urtwewtcn"



Hki wtg'70Ugpukkkk{ "qh'r tgf levgf "IRER'urcd"etcembpi "vq'urcd" yi lempguu. 'uvddcug'v{ r g"cpf "lqlpv'ur celpi 0

Vj g"tguvnu"qh"yj gug"twpu"ctg"uj qy p"kp"Hki wtg"7."y j kej " uj qy u" yj cv"kpetgcugu"kp"r tgf kevgf "etcenkpi "y kyj "kpetgcukpi " lqkpv" ur cekpi " *hqt" c" i kxgp" r cxgo gpv" yj kempguu+" ctg" uki pkhkecpv{"uo cmgt"hqt" yj g" uvcdkhugf "uvddcug"ecugu" yj cp" hqt"yj g"wpuvcdkhugf "uvddcug"ecugu0'K/ecp"cmq"dg"uggp" yj cv" yj g" r tgf kevgf " tcvgu" qh" urcd" etcenkpi " ctg" i gpgtcm{"o wej " mqy gt" hqt" yj g" wpuvcdkhugf " uvddcug" ecugu" yj cp" hqt" yj g" ucdkhugf " uvddcug" ecugu0' Vj ku" ku" tghrgevgf " kp" yj g" j ki j " etcenkpi " tcvgu" r tgf kevgf " hqt" Egmu" 7" cpf " 8" eqo r ctgf " vq" yj qug" r tgf kevgf " hqt" Egmu" 96; ." cu" uj qy p" kp" Vcdng" 60' C"uko krct" tgpf "ecp"dg"uggp"hqt" yj g"32/{gct"egmu"*Egm'32" xu0Egmu'33635+0

Uko krct" tguwnu" y gtg" hqwpf" kp" ugpukkxkk{" cpcn{ugu" r gthqto gf" hqt" yjg" HJ Y CO' Rtgf kevgf" etcemkpi "tcvgu" y gtg" f gvgto kpgf" hqt" w q" f khtgtgpv" v{r gu" qh" uwddcug" *qr gp/" i tcf gf" cur j cn/uxcdkkugf " xu0' i tcpwrct +0' F cvc" htqo " o qtg" yj cp"5222"O GRF I "twpu"kpf kecvg"yj cv'o qtg" yj cp"72' "qh'yj g" r cxgo gpvu" o qf gmgf" y kyj " cur j cn/vtgcvgf " uwddcugu" y gtg" r tgf kevgf "vq"gzj kdk/"muu"yj cp"32' "etcenkpi ."y j kmg"72' "qh" yj g" urcdu" o qf gmgf " y kyj " i tcpwrct" uwddcugu" y gtg" r q"gzj kdk/o qtg'yj cp'92' "etcenkpi "*0 w'gv'cn/4232+0

Vj gug" vtgpf u" ctg" eqwpvgt/kpwkkxg" cpf" cpqo cmwu0' Uvcdkrhugf "uwddcugu"ctg"v{r kecm{ "wugf "dgecwug" vj g{ "j grr "vq" tgf weg" yj g" r qvgpvkcni hqt" hcwnkpi 0' J qy gxgt." uvcdkrhugf " uwddcugu" i gpgtcm{ "fghqto " muu" vj cp" i tcpwrct" uwddcug" o cvgtkcni. "tguwnkpi " kp" rcti gt" wpuwr r qtvgf " urcd" ctgcu" cpf " eqttgur qpf kpi n{ "j ki j gt" ewtrkpi ly ctr kpi " uvtguugu" kp" vj g" r tgugpeg" qh' vgo r gtcwtg" cpf " o qkuwtg" i tcf kgpvi." tguwnkpi " kp"kpetgcugf 'r qvgpvkcn'hqt'urcd"etcenkpi 0

Eqpulf gtcvkqp"qh"y g"cuuwo gf "dqpf "eqpf kkqp"dgw ggp" y g"uncd"cpf "uvcdkkugf "uvddcug"o ki j v"j grr "vq"gzr nckp"y ku" cpqo crqwu" r gthqto cpeg" r tgf kevkqp0' Kt" y g" uvcdkkugf " uvddcug'tgo ckpu'dqpf gf "vq"y g'dqwqo "qh'y g'urcd."y g



Hki wtg" 80' Ghhgewi'' qh'' uwddcug" v{rg" cpf" urcd" ó" uwddcug" dqpf" eqpf kkqp"qp"etcemkpi 'hqt"ugngevgf ''O p IT QCF ''guv'egni'xctkcdrgu0

urcd"ó"uwddcug"u{uvgo "y kni'cev'cu'c"eqo r quksg"urcd"y kj "cp" ghgevkxg"urkhtpguu"y cv'ku'i tgcvgt"y cp"y cv'qh"y g"urcd"cmpg0' Kp" y ku"ecug." urcd" uvtguugu" y qwrf "dg"tgf wegf "cpf "c"rcti gt" pwo dgt" qh" mcf u" y qwrf "dg" ecttkgf " dghqtg" urcd" etcenkpi " f gxgnqr u0' Vj ku"dgj cxkqwt"ku"kmwurcvgf "kp" Hki wtg"8." y j kej " uj qy u" yj g" r tgf kevgf " urcd" etcenkpi " hqt" uko krct" r cxgo gpv' ugevkqpu" *Egmi 7." 3; 2" o o /yi keni' REE" urcd" qp" i tcpwrct" uvddcug"cpf "Egmi 9."3; 7" o o /yi keni' REE" urcd" qp" cur j cn/" tgcvgf "dcug+i'cuuwo kpi "yi tgg"f khtgtgpv'uwddcug"uw r qtv'cpf " dqpf kpi "eqpf kkqpu<*3+"uvcdkrkugf "uwddcug" y kj "f gdqpf kpi " cuuwo gf "q"qeewt"chrgt"3"{gct=*4+'uvcdkrkugf "uwddcug"y j gtg" y g"dqpf "dgy ggp" y g"urcd"cpf "uwddcug" tyu"42"{gctu="cpf "

Hqt"yj g"gzco r ng"r tgugpygf "kp"Hki wtg"8"cpf "cuuwo kpi "c" hcknwtg"etkgtkqp"qh"42' "uncd"etcenkpi."yjg"r cxgo gpv"y kj " yj g" i tcpwrct" uwddcug" *Egml 7+" cpf " y kyj " yj g" uvcdkrkugf " uwddcug"y cv'dgeco g"f gdqpf gf "chygt"3" { gct"*Egm'9+"y qwrf " dqvj " hckn" chvgt " crrtqzko cvgn{" 4" {gctu0' J qy gxgt." vj g" r cxgo gpv" y kj " c" uvcdkrkugf " uvddcug" f gxgrqr gf " rguu" etcenkpi " kp" yj g" hktuv" { gct" y j gp" yj g" dqpf kpi " y cu" cevkxg0' Vj g" f gxgrqr o gpv" qh" etcenkpi " ku" f grc { gf " wpvkn" y grn" chvgt " {gct": "y j gp"uncd"ó"uwddcug"dqpf "ku"o ckpvckpgf "hqt"42"{gctu0' Ke'ecp"dg"eqpenxf gf "yj cv'urcd"ó"uwddcug"dqpf "eqpf kkqp"ecp" j grr "vq" gzr nckp" y j {"c"r cxgo gpv" y kj "c"uvcdkrkugf "uvddcug" o ki j v" gzj kdkv" nguu" etcemkpi " yj cp" qpg" y kj " c" i tcpwrct" uwddcug0' J qy gxgt." qpg" y qwrf " uwm" gzr gev" y g" r cxgo gpv" y ký " ý g" i tcpwrct" uwddcug" vq" gzj kdkv" uwduvcpvkcm{" rguu" etcemkpi "vj cp"vj g"qpg"y kj "uvcdkrkugf "uvddcug"vj cv"dgeco g" f gdqpf gf " chygt " 3" {gct " wprguu " y g" lqkpv " ur cekpi " y cu" uwhhkelgpvn{" uj qtv" yj cv" ewtrkpi ly ctr kpi " uvtguugu" dgeqo g" kpuki pkhkecpv0

Eqtkpi "cv" O p ITQCF "j cu" uj qy p" yj cv" i qqf "dqpf "uvkn" gz kıvu"dgwy ggp" yj g"urcd"cpf "yj g"uvcdkrkugf "uvddcug" *kp" egmi" wukpi "uvcdkrkugf "uvddcug" o cvgtkcnı+=" yj gtghqtg." k/" y cu" cuuwo gf "yj cv" yj g" dqpf "ncuvu" yj g" rktg" qh" yj g" r cxgo gpv" uvtwewtg" y j gp" r tgf kevkpi " etcenikpi "wukpi " yj g" O GRF I 0' Ku" yj g" dqpf " y cu" cuuwo gf " vq" hckr" dghqtg" yj g" gpf " qh" yj g" cpcn(uku" r gtkqf." yj g" r tgf kevgf " etcenikpi " xcnwgu" *r tgugpvgf " kp" Vcdrg" 6+" y qwrf " j cxg" dggp" gxgp" o qtg" f kxgti gpv'htqo 'yj g"qdugtxgf "etcenikpi "xcnwgu0



Hkiwtg'90Ghhgevu'qh'uvddcug'v{rg'qp'LRER'uncd'etcennkpi 'hqt'' fkhhgtgpv/EVGu0

Vj g"O GRFI "ku"s vksg"ugpukskx g" vq" vj g" cuuvo gf "uncd" ó" uwddcug"dqpf "nhg."gxgp"hqt"y kengt"uncdu0'Dguhf gu"Egmu"7" cpf "9." Hki wtg" 8" cnuq" r tgugpvu" vj g" tguwnv" qh" O GRF I "twpu" yj cv' y gtg" o cf g" hqt "Egm' 32" *477" o o /yj kem' REE" urcd" qp" cur j cn/vtgcvgf " uwddcug+0' Cm' y tgg" egmu" j cxg" y g" uco g" r cpgn' ngpi vj " *806" o +0' Rtqlgev' cxgtci g" REE" o cvgtkcn' rtqrgtvlgu"ygtg"wugf "hqt"cm' y tgg"ecugu"uq "y cv'rtgflevgf" r gthqto cpeg"f khigtgpegu" y qwrf "dg" cwtkdwgf "uqrgn{" vq" y g" ghigevu"qh"urcd" y kenpguu. "uwddcug" v{r g"cpf "urcd"ó"uwddcug" dqpf "eqpf kkqp0'Vj g"etcemkpi "r tgf kevgf "hqt "Egm'9"*y kppgt" urcd"qp"c"uvcdkrkugf "dcug+"ku"rqy gt"y cp"y cv"r tgf kevgf "hqt"c" y kp"uncd"qp"c"i tcpwrct"uwddcug"*Egm'7+"cu"rqpi "cu"y g"uncd" cpf " uvcdkrkugf " dcug" ctg" dqpf gf 0' Y j gp" urcd/uvcdkrkugf " uwddcug"dqpf "ku"cuuwo gf "vq"hckn"chvgt"3" { gct." y g"r tgf kevgf " etcemkpi " qh" Egm' 9" uqqp" uwtr cuugu" yj cv' qh' Egm' 70' Eqorctkpi " y g" etcemkpi " rtgfkevkqp" ewtxgu" hqt " 3/{gct" dqpf "nkhg"cpf "42/{gct"dqpf "nkhg"cuuwo r kqpu"hqt"dqyj "Egmu" 9"cpf "32."k/ecp"dg"uggp"y cv'y g"ghgev'qh'y g"urcd"o"uvddcug" dqpf "eqpf kkqp" cr r gctu" vq" dg" o qtg" uki pkhecpv" hqt" yj kengt" uncdu0

Vj ku"dgj cxkqwt"ecp"dg"hwt y gt "gxcnwcyf" d{ "gzco kpkpi " y g" ugpukkk k{ "qh" y g" r tgf keyf" urcd" etcemkpi " vq" uwddcug" v{ r g"cpf "xct {kpi "E VG"r tqr gt vgu0'Hki wtg"9"uwo o ctkugu" y g" tguwnu" qh" f cvc" htqo " y g" r tgxkqwun{ "tghetgpegf " 5222/twp" HJ Y C"uwf {"qh"O GRF I "ugpukkk k{ "*Xcpf gpdquuej g"gv"cn0' 422: +"cpf " uj qy u" y cv"kpetgcukpi " y g" eqpetgvg"E VG" *d{ " 55' +" uvtqpi n{ "chhge vu" urcd" etcemkpi " kp" y g" ecugu" y kj " i tcpwrct" uwddcug" o cvgt kcml *r tguwo cdn{ "f wg" vq" uki pkhk/ ecpvn{ "kpetgcugf "ewtnly ctr "uvtguugu+"dw1 jcu"hkwrg"ghhgev'qp" urcd" etcemkpi "lnqt"ecugu" vukpi "ucdkrkugf "uwddcug" o cvgt kcml *r tguwo cdn{ "f wg"vq"eqo r qukkg"cevkqp"qh" y g"dqpf gf "urcd" uvddcug+0

Vj g" qý gt" qdugtxcvkqp" ý cv" ecp" dg" o cf g" htqo " ý ku" cpcn{uku"eqpegtpu"ý g"ugpukkxkx{ "qh"ý g" O GRF I /r tgf kevgf " urcd"etcenkpi "vq"tgrcvkxgn{"uo cm"ej cpi gu"kp"urcd"ý kempguu0 Hqt" gzco r ng."eqpukf gtkpi "Hki wtg"7"cpf "ý g" f cvc"r tqxkf gf " hqt" ý g" r cxgo gpv" y ký " ý g" i tcpwrct" uvddcug" cpf " 6080 " r cpgn'ngpi ý u."kv"ecp"dg"uggp"ý cv"c"437"o o "urcd"ý kempguu" y qwrf "o ggv" ý g" r gthqto cpeg" etksgtkqp" qh"j cxkpi "nguu" ý cp" 42' " r tgf kevgf " urcd" etcenkpi " ý tqwi j qw" ý g" r cxgo gpv" ugtxkeg"nkhg0'F getgcukpi "y g"urcd"y kenpguu"d { "lwuv'8"o o "*q" 42; "o o +"tguwnu"kp" y g"r tgf kekkqp"qh"cdqwv" y keg"cu"o wej " urcd"etcemkpi "*cdqwv"57' "vqvcn+"cv" y g"gpf "qh" y g"r cxgo gpv" r gthqto cpeg" r gtkqf 0' I kxgp" y cv" kv" ku" pqv" wpeqo o qp" hqt" REE "urcd" y kenpguu"vq"xct { "d { "` "32"o o "qp"o cp { "r tqlgevu" kv"ku"ko r qtvcpv" y cv" f guki pgtu"dg"cy ctg"qh"cpf "eqpukf gt" y g" ghgevu" qh" v{r kecn" urcd" y kenpguu" xctkcdktk{" qp" urcd/ etcemkpi " r gthqto cpeg" y j gp" guvcdnkuj kpi " hkpcn" f guki p" y kenpguugu0

Gxcnwcvkpi " rqcf " vtcpuhgt." hcwnkpi " cpf " KT K r tgf levkqpu" Vj g"cdktk{ "qh" vj g"O GRF I " vq"ceewtcvgn{ "r tgf lev' vtcpuxgtug" lqkpv'NVG.'lqkpv'hcwnkpi "cpf "KT Ky cu'gxcnwcvgf 0

Vj g" O GRF I " i gpgtcm{" f kf " c" i qqf " lqd" qh" r tgf kevkpi " NVG. "cu"ku"uj qy p"kp"Hki wtg": ."y j gtg"vj g"r tgf kevgf "NVG"ku" eqo r ctgf " q" vj g" o gcuwtgf " xcnvgu" hqt" Egmi 330' Cnj qwi j " ugcuqpcn' xctkcvkqp" kp" NVG" y cu" qdugtxgf " kp" dqvj " vj g" r tgf kevgf " cpf " o gcuwtgf " NVG" xcnvgu." vj gug" xcnvgu" tgo ckpgf "tgrcvkxgn{" eqpuvcpv' qxgt" vko g0' O gcuwtgf " ugcuqpcn! NVG" xctkcvkqpu" y gtg" i gpgtcm{" urki j vn{" j ki j gt" vj cp" qdugtxgf " NVG" xctkcvkqpu0' K/' y cu" cmq" pqvgf " vj cv' vj g"NVG" f qgu" pqv' cr r gct" vq" dg" kphrvgpegf " d{" vj g" kpr w' xcnvg" hqt" $SV_{dvknvkp}$ 0'Vj gug"qdugtxcvkqpu'j grf "twg"hqt"cm'qh'vj g"7/"cpf " 32/{gct"egmi'cv'O p IT QCF 0

Vj g" O GRF I " cnq" r tgf kevgf " y g" qdugtxgf " hcwnkpi " tgrcvksgn{" y gm' hqt" y g" O p fT QC F " vgw' ugevkqpu0' Vq" knwutcvg." y g" o gcuwtgf " cpf " r tgf kevgf " hcwnkpi " xcnwgu" qxgt"vko g"ctg"r tqxkf gf "kp"Hki wtgu"; "cpf "32"hqt"Egmu"33"cpf " 8. "tgur gevksgn{0' Vj g" r tgf kevkqpu" y gtg" tgcuqpcdrg" guvko cvgu" qh'o gcuwtgf "hcwnkpi "hqt"y g"htuv": "6"32" { gctu"qh'r cxgo gpv' ugtxkeg" nhg." chgt" y j kj " vko g/qdugtxgf " hcwnkpi " ngxgni" hgm! wpgzr gevgf n{0' Ki' uj qwf " dg" pqvgf " y cv' y g" f kthgtgpegu" dgw ggp" r tgf kevgf " cpf " qdugtxgf " hcwnkpi " o gcuwtgo gpw0' Vj g" hcwnkpi "cpcn{ugu"hqt" gcej " egml *y j kj ."kp" y g" koytguv' qh' dtgxkv{." ctg" pqv' cm' r tgugpvgf " j gtg+" kp kecvg" y cv' y g"



Hki wtg": 0Rtgf kevgf "cpf "qdugtxgf "NVG"hqt "Egm"330



Hki wtg"; 0Rtgfkevgf "cpf "qdugtxgf "hcwnkpi "hqt"Egm'330

$$\begin{split} & \mathbb{E}V_{dwkn/kp} "^{\$} \ensuremath{\mathsf{A}} \ensuremath{\mathsf{Q}} \ensuremath{\mathsf{G}} \ensuremath{\mathsf{A}} \$$

Vj g" ceewtce{" qh" O GRF I " KT K r tgf kevkqpu" y cu" cnq" gxcnxcvgf 0'Ukpeg" y g"O GRF I "guvko cvgu"qh'KT Kctg"dcugf "qp" r tgf kevqf " f kutguu" xcnvgu " y g" ceewtce{" qh" y g" KT K r tgf kevkqp" ku" f ktgevn{" tgrcvgf" vq" y g" ceewtce{" qh" y g" KT K r tgf kevkqp" ku" f ktgevn{" tgrcvgf" vq" y g" ceewtce{" qh" y g" GRF I "urcd"etcemkpi ."hcwnkpi "cpf "NVG"o qf gnu" *cu" y gm' cu" y g" ceewtce{" qh" y g" O GRF I "kT K o qf gn+7 tgecm' y cv" npi gt/vgto "hcwnkpi "r tgf kevkqpu" *k0g0'hqt"ugtxkeg" nkbg" È Á 32" {gctu+" ko r tqxgf "d{" wukpi " y g" o gcuvtgf "cu/dwkn' xcnvgu"qh' GV_{dwkn/kp}" dw' y cv'etcemkpi "r tgf kevkqpu" ko r tqxgf "d{" wukpi " y g" f ghcwn/"xcnvg"qh' GV_{dwkn/kp}" *ugg"Hki wtg"6+0'Rtgf kevgf "cpf " qdugtxgf " KT K xcnvgu" hqt" Egmi 33" ctg" r mygf " ci ckpuv" r cxgo gpv'ci g'kp"Hki wtg"33.'y j kej 'uj qy u'yj cv'y g"ceewtce{" qh''y g"KT K'r tgf kevkqpu"y cu"dgu'y j gp" y g"f ghcwn/"xcnvg"qh"



Hki wtg'320 Rtgf kevgf "cpf "qdugtxgf 'hcwnkpi "hqt 'Egm'80



Hki wtg'330Rtgf kevgf "cpf "qdugtxgf "KT Khqt 'Egm'330

𝔅~} ^→~áäæäÅÑ] İÁYÜá ^äæ^â~bb ′åæÊÅÕ | →→æŸÁN \ İÁ€GİI ÎÁFFÁN | & | b \ÁG€F€



Vj g" ugtxkeg" nxgu" qh" yj g" O p ITQCF " o ckprkpg" REE " vguv" ugevkqpu" y gtg"r tgf kevgf "wukpi " y g" O GRF I " cpf " eqo r ctgf " vq" rtgfkevkqpu" qdvckpgf" wukpi " ugxgtcn' qvjgt" fgukip" ogyjqfu0'C"rtgxkqwu"uwwf{"gxcnwcvgf"yjtgg"ugrctcvg" o gyj qf u" hqt" r tgf kevkpi " f guki p" nkhg" *Dwtpj co " cpf " Rktmi" 3; ; 9+0'Vj gug"o gyj qf u"kpenwf gf "yj g"3; ; 5"CCUJ VQ"I wkf g" hqt"F guki p"qh"Rcxgo gpv"Uttwewtgu"*wukpi "72' "tgrkcdkrkv{+" cpf " yj g" Rqt vrcpf " Ego gpv" Cuuqekcvkqp" *REC+" F guki p" hqt" Eqpetgvg" J ki j y c{" cpf " Utggv" Rcxgo gpu" *3; : 6+." y j kej " j cu" c" dwkn/kp" ngxgn" qh" tgrkcdkrkv{ " dgw ggp" ; 2" cpf " ; 7' " *Rcemctf "cpf "Vc{cdlk'3; : 7+0

Cu/dwkn/"r ctco gvgtu" hqt" xctkcdngu" uwej "cu"Ot." GE" cpf " kpk.kcn'' KTK' y gtg'' wugf " kp'' y g'' cpcn{ uku0' Gcej " cf f k.kqpcn'' f guki p"kpr w/"*uwej "cu"yj g"m/xcnwg+"y cu"guvcdrkuj gf "wukpi " yj g"o gyj qf qnqi kgu"f ghkpgf "y kj kp" gcej "tgur gevkxg"r tq/ egf wtg0' Hqt" gzco r ng." y g" eqpetgvg" O_t" y cu" f gvgto kpgf " dcugf "qp"4: /f c { ''y kt f / r qkpv"mcf kpi "dgco "vguvu"*CUVO "E" 9: /: 6+" wukpi " uco r ngu" qdvckpgf " f wtkpi " eqpuvt wevkqp0' F gvckrgf "kphqto cvkqp"qp"j qy "gcej "qh"y g"r ctco gvgtu"y cu" guvcdrkuj gf "ecp"dg"hqwpf "kp"Xcpf gpdquuej g"gv"cn0*422: +0' Cml'f guki pu"y gtg"dcugf "qp"vtchhke" y cv"y qwrf "r tqf weg"3" o kmkqp"GUCNu"kp"yj g"hktuv"{gct"y kj "c"eqo r qwpf "vtchhke" i tqy yj 'tcvg''qh'407' 0Vj g'f ghcwnv'xcnwgu'kp''yj g'O GF RI 'hqt" xgj keng"encuu'f kuxtkdwkqp."czng"nqcf "f kuxtkdwkqp"hcevqtu"cpf " j qwtn{"cpf"o qpyj n{"f knvtkdwkqpu."y j kej "y gtg"qdvckpgf" htqo "pcvkqpcn'ecnkdtcvkqp"ghhqtvu. "y gtg"go r m{gf0

C"f gvckrgf "eqo r ctkuqp" qh" y g" r tgf kevgf "r gthqto cpegu" qdvckpgf " wukpi " yj g" REC" cpf " CCUJ VQ" 3; ; 5" f guki p" r tqegf wtgu" ku" r tqxkf gf " kp" Xcpf gpdquuej g" *4225 ⊨" yj g" hqewu" j gtg" ku" qp" eqo r ctkpi " y g" r tgf kevgf " nkxgu" qdvckpgf ' wukpi " yi gug" r tqegf wtgu" y kyi " yi g" r tgf kevgf " nkhg" qdvckpgf " wukpi ''yj g'O GF RI 0

O gcuwtgf " cu/dwkw' REE " r tqr gtvkgu" y gtg" wugf " hqt" cm' egmu" kp" yj ku" cpcn{uku0' C" uwo o ct { " qh" yj g" tguwnu" qh" yj g" O GRF I "twpu" hqt" y ku" cpcn{uku" ku" r tqxkf gf " kp" Vcdng" 9." y j kej "uj qy u"yj cv"yj g"O GRF I "r tgf kevu"vtcpuxgtug"etcemkpi " cu'y g'o qf g'qh'hcknwtg'hqt'y g'7/{gct'egmu0Cmlqh'y g'32/

Rtgf levgf 'r gthqto cpeg Hcwn/f gr y d" Rtgf kevgf "hkhg" Etcempi ^c" KT K" * + Egm *00+ *o 1mo + *{ gctu+ 7 37 20;30: 8 8 37 20253083 3 37 307 30; 33 9 2047 : 37 402: 5 37 30: 33 405: 32 205 3085 4094 55 33 505 302: 409453 204 308: 4094 52 34 35 37 307 4034 37

{gct"egmu."y kj "y g"gzegr kqp"qh"Egm"35."ctg"r tgf kevgf "vq" hckn" fwg" vq" gzeguukzg" tqwijpguu0' Vjg" hcknwtg" o qfg"

Vcdrg": "r tqxkf gu" c"uwo o ct{"qh" y g" guvko cvgf "ugtxkeg"

nkxgu"hqt"gcej "yguv"egm"cu"r tgf keygf "d{"yj g"xctkqwu"f guki p"

o gyj qf qrqi kgu0' kp" i gpgtcn" yj g" O GRF I "v{r kecm{"r tgf kevu"

ugtxkeg" nxgu" hqt" y g" y kppgt" urcdu" *7/{gct" o ckpnkpg" egm+"

y cv"ctg"cu"nqpi "cu"*qt"nqpi gt"y cp+"y qug"rtgf kevgf "wukpi "

yig" qyigt" fgukip" ogyiqfqnqikgu0'Cml'fgukip" ogyiqfu" wpf gtguvko cvgf " y g" r tqlgevgf " r gthqto cpeg" nxgu" qh" y g" 7/"

{gct"f guki p"vguv"egmu0'Vj g"O GRFI "r tgf kevu"mpi gt"ugtxkeg"

nkxgu"hqt" y g" y kengt" *32/ { gct" f guki p+"O p ITQCF "vguv" egmu"

yj cp"yj qug"guvko cvgf "d{"yj g"3; ; 5"CCUJ VQ"r tqegf wtg."dwi"

nguu" yj cp" yj qug" guvko cvgf " d{" yj g" REC" r tqegf wtg." gxgp"

yj qwi j "c"i tgcvgt"ngxgn'qh"tgrkcdkrkv{ "ku"kpeqtr qtcvgf "kp" yj g" REC" rtqegfwtg0' Yjgp" yjg" hcknwtg" oqfg" ku" hckliwg"

etcemkpi ."yj g"O GRF I "cpf "yj g"3; ; 5"CCUJ VQ"r tqegf wtgu"

tguwn/"kp"uko krct"rtgfkevgf"rgthqtocpeg"nkxgu0'Vjg"rtgfkevgf" rgthqto cpegu" qdvckpgf "wukpi "y g" OGRFI "rtqegf wtg"

y gtg" o qtg" uko knct" vq" vj qug" qdvckpgf " htqo " vj g" REC"

r tqegf wtg" y j gp" y g" o qf g" qh" hcknwtg" y cu" pqv" hcki wg"

3;:6'REC"

O GRF I

8

3

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5

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53

52

37

o gy qf

5

3

4

3

4

98

82

98

8;

Vcdng": 0'Eqo r ctkuqp"qh'ugtxkeg/nkhg'r tgf kevkqpu'hqt 'O p IT QCF "

o ckprkpg'REE "egmu'wukpi "xctkqwu'f guki p'o gyj qf u0

3;;5"CCUJ VQ"

*72' 'tgnkcdknkv{+

7

5

5

9

3;

34

38

38

etcenhpi 0

Vguv'egmi

7

8

9

32

33

34

35

Vcdng'90'O GRF I 'r gthqto cpeg'r tgf levkqpu'hqt'O p IT QCF "

o ckpnkpg'REE "vguv'egmu0

 $S^{a} = \frac{1}{2} S^{a} = \frac{1}$ ^áÁŒæàá |→\Á\åãæbå~→äÁ´ã↔\æã↔áİÁFIÃÁ´ãá´↔^&È

33

âÁŒæàá │→∖Á∖åãæbå~→äÁ´ã⇔∖æã⇔áİÁĞÈ€IÁ↑↑È

rtgfkevgf "hqt"Egml35"ku vtcpuxgtug"etcemkpi 0

´ÁŒæàá |→\Á\åãæbå~→äÁ´ã↔\æã↔áİÁGÈÍGÁ↑Đ←↑È

Hqt" o quv" qh" yjg" fguki pu" eqpukfgtgf" *cpf" jqnfkpi"

r tqlgevgf " r gthqto cpeg" nHg" eqpuvcpv+." yi g" O GRF I " y qwrf " tguwn/"kp"'yi kppgt"urcd"f guki p"'yi kenpguugu"y j gp"eqo r ctgf " vq" f guki pu" qdvckpgf " wukpi " yi g" 3; ; 5" CCUI VQ" r tqegf wtg0' Wukpi " yi g" O GF RI " y qwrf " cnq" tguwn'' kp" yi kppgt" urcdu" hqt" yi g"7/{ gct"egmu" yi cp"f qgu" yi g"REC"r tqegf wtg." dw''yi kengt" f guki pu'hqt''yi g"32/{ gct"egmu0

Uwo o ct { "cpf "eqpenwukqpu

Y j gp"c"pgy "f guki p"r tqegf wtg"ku"kpvtqf wegf ."kv"ku"ko r qt vcpv" vq" gxcnvcvg" ku" cdkrkv{" vq" rtgf kev' cewcn' r cxgo gpv' r gthqto cpeg0' Kp" yi ku" tgugctej ." c" xcrkf cvkqp" qh" O GRF I "ku" ecttkgf "qwi'kp"vgto u"qh"ku"cdktkv{ "vq"r tgf kev'vj g"r gthqto cpeg" qh" LRE Ru0' Vj ku" ku" ceeqo r nkuj gf " d{ " eqo r ctkpi " yj g" r tgf kevgf "cpf "qdugtxgf "r gthqto cpeg"r ctco gvgtu"qh"ugxgtcn" kp/ugtxkeg" o ckprkpg" vguv" egnu" cv" O p ITQCF ." y j kej " ku" c" f gpugn{ "kputtwo gpvgf "r cxgo gpv" vguv" hcektkv{ " vj cv" y cu" pqv" wugf "kp" yj g"ecnkdtcvkqp" qh" O GRF I 0'Eqo r ctkuqpu" dgw ggp" qdugtxgf "cpf "r tgf kevgf "urcd"etcemkpi "xcnwgu"kpf kecvg" yj cv"k/" ku"dguv"kh"y g" EVdwww/wp" ku" vtgcvgf "cu" c"eqpuvcpv" *wukpi "y g" O GRF I /tgeqo o gpf gf 'f ghcwn/'xcnwg+'tcyj gt 'y cp''cu''c''ukwg/ ur gekhle"kpr wi'xctkcdrg"kp" y g"O GRF I "cpcn{ uku0'Hwt y gt/ o qtg."y j gp"y g"f ghcwn/"xcnwg"qh"
 $\mathbb{E}V_{dwhn/kp}$ "ku"wugf "kp"y g" O GRF I "cpcn{ uku."eqpetgvg"r cxgo gpvu"vgpf "vq"hckn'f wg"vq" vqr/f qy p"etcemkpi "o quv'qh'y g'vko g0

C" emug" mqml y cu' vcmgp" cv' y g" ko r cevu" qh' y g" REE" o cvgtkch' r tqr gtvlgu." r cxgo gpv' uvtvewtch' r ctco gytu" cpf " y g" O GRFI " uvcpf ctf " hvli vg" f co ci g/etcembpi " r gthqto / cpeg"ewtxg"qp'O GRFI "r tgf kevlqpu"qh'urcd"etcembpi 0'K'y cu'' pqvgf "y cv"gxgp"y qwi j "y g"vco g"REE" o kzwtg"f guli p"y cu'' wugf "hqt"cm'y g"egmu." y gtg" y cu''uki pkhecpv'xctkcdktk{ "kp"y g" tguwnu" qh' vguu" qh'' cu/dwhv' REE " r tqr gtvlgu" dgw ggp" egm0'' Etcembpi " r gthqto cpeg" r tgf kevlqpu" y gtg" i tgcvn{" ko r tqxgf " d{ "wulpi "REE" r tqr gtv{gr usv'' gy g" cy'' tgr tguspvgf " y g" cxgtci g" cpf lqt" o gf kcp" qh''cm' o gcuvtgo gpu" kp''cm' guv''egmt=" y gug" xcnvgu" ctg" dgtlgxgf " vq' dg" o qtg" tgr tguspvcvkxg" qh''y g" txgw y g" gtggthgeu" qh''o f. "G_E"cpf "E VG"uwi i guu''y cv''uo cm'ej cpi gu'' kp''kpr wy''zcnvgu'''

Vj g" ghtgeuu" qh" r cxgo gpv" uvt wewtch" hgcwut gu" *gft 0' urcd" yi kempguu." lqkpv" ur cekpi ." uwddcug" v{ r g" cpf " urcd" 6" uwddcug" dqpf " eqpf kkqp+" qp" urcd/etcenkpi " r tgf kekqpu" y gtg" kpxgurki cvgf 0' K" y cu" hqwpf " yi cv" kp" uqo g" ecugu." c"f getgcug" kp" urcd" yi kempguu" hqt" yi g" uwf kgf " r cxgo gpv" qh" cu" nkwg" cu" 8" o o " y qwrf "tguwn/"kp" r tgo cwtg" hckmetg0' Vj ku" kmwut cvgu" yi g" pggf " vq" dg" cy ctg" qh" yi g" r qvgv kch" f khtgt gpegu" dgw ggp" yi g" f guki pgf " r cxgo gpv" cpf " cu/ dwn" r cxgo gpv" uge kqpu" y j gp" gucchkuj kpi " yi g" hkpcn" f guki p" yi kempguu." dgecwug" x ctkckqpu" kp" urcd" yi kempguu" qh" ` " 32" o o " ctg" pqv" wpeqo o qp" kp" eqput werkqp0

Cp"crrctgpv"rgthqtocpeg"rtgfkevkqp"cpqocn{"ycu"cnq" hqwpf<'jg"wug"qh"c"uvcdkkugf"uwddcug"ku"rtgfkevgf"vq"tgfweg" vtcpuxgtug" urcd" etcenkpi "yjkrg" yjg" wug" qh" cp" wpdqwpf" *i tcpwrct+"uwddcug"ku"r tgf levgf "vq"tguwn"kp"j ki j gt"tcvgu"qh" etcenkpi 0' Vj ku" o c{"dg" gzr rckpgf"d{"eqpukf gtcvkqp" qh" yj g" urcd"ó"uwddcug"dqpf "eqpf kkqp0'Vj g"uki pkhecpeg"qh'yj g"dqpf " qp" yj g" r tgf kevgf " etcenkpi " j cu" dggp" engctn{"kmwutcvgf "kp" y ku"uwuf {0'J qy gxgt."yj gtg"ku"pq"i wkf cpeg"r tqxkf gf " y kj kp" yj g" O GRF I "kp" j qy "vq" f gvgto kpg" yj g" f gi tgg" qh" dqpf " qt" j qy " npi " yj g" dqpf " y qwrf" dg" ghtgevkxg0' Ki" y qwrf " dg" dgpghkekcn' kh' uwej " i wkf cpeg" ku" guvcdnkuj gf 0' Cpqy gt" crr ctgpv'cpqo cn{"ku'yj cv'yj g"kpetgcug"kp"rtgf kevgf "etcenkpi " y kj "kpetgcukpi "]qkpv'ur cekpi "ku"uki pkhecpvn{"rcti gt"hqt" y g" r cxgo gpwu" y kj "wpuvcdkkugf "uwddcugu" y cp" hqt" yj qug" y kj " uvcdnkugf 'uwddcugu0

K/ y cu" cmq" eqpenvf gf " y cv" y g" O GRF I " hcvki vg" fco ci g/urcd" etcembpi " rgthqto cpeg" evtxg" y cv' y cu" echdtcvgf " pcvkqpcm{" fqgu" pqv" pgeguucthn{" hkv" mecn" rgthqto cpeg" fcvc0' Hqt" gzco rm." kv" vgpf u" vq" qxgtguvko cvg" y g" rtgf kevgf " etcembpi " hqt" y g" O p ITQCF " hcekhs{0' Vq" ko rtqxg" y g" rtgf kevcdktks{." y gtg" ku" c" pggf " vq" guvcdnkuj " mecniechktcvkqp" hcevqtu" hqt" uvej "ecugu0

Qpg"qh"ý g"f kucf xcpvci gu"qh"ý g"O GRF I "ku"ý cv"ky"vcngu" kpvq"ceeqwpv"ý g "tgrkcdktk{ "dcugf "qp" ý g"cuuguuo gpv"qh" ý g" qxgtcm" uvcpf ctf "gttqt"qh" rtgf kevgf "f kutguugu" cu"eqo r ctgf " vq"ý g"qdugtxgf "f kutguugu0'Ukpeg"o gcp"xcnwgu"hqt" ý g"kpr wu" y gtg"wugf "kp"guvcdrkuj kpi "ý g"tgrkcdktk{ "rgxgnu." ý g"xctkcpeg" qh" ý g"kpr wu" ku" pqv" cuuqekcvgf " y kj " ý g" r tgf kevkqpu0' Vj ku" uwf { "uj qy u" ý cv" ý g" O GRF I " r tgugpvu" ý g" j kj guv" r tgf kevcdktk{ "kp" dqý " o gcp" xcnwgu" cpf " xctkcpeg" kh" ý g" o gcp"xcnwg"qh"ý g"o cvgtkcn"kpr wu"ku"wugf "cpf "hutý gto qtg"kk" uggo u" gz vtgo gn{ "ugpukkxg" vq" ý g" kpr wu." gxgp" y kj kp" ý gkt" pqto cn'xctkcpeg0

Vj g"O GRF I "f kf "c"i qqf "lqd"kp"r tgf kevkpi "vj g"qdugtxgf " rgxgni" qh' NVG" cpf " hvmkpi 0' Gxgp" vj qwi j " ugcuqpcn' xctkcvkqpu" kp" dqvj " r tgf kevgf " cpf " qdugtxgf " NVG" xcnvgu" y gtg" pqvgf " qxgtcm' NVG" o gcuvvtgu" hqt " gcej " vguv" egm' tgo ckpgf " tgrcvkxgn{" eqpuvcpv' qxgt" vlo g0' Vj g" hcwnkpi " r tgf kevkqp"qdvckpgf "y j gp" vj g"f gfcwm'xcnvg"qh" $\mathbb{E}V_{dvknv/p}$ "y cu" wugf "o qtg"enqugn{" o cvej gf "vj g"qdugtxgf "r gthqto cpeg"hqt" gcej "egm0C"dgwgt 'r tgf kevkqp"qh'vj g"qdugtxgf "KT Ky cu'cunq" cej kgxgf "y j gp" vj g"f gfcwm/ $\mathbb{E}V_{dvknv/p}$ "qh'GA707 \hat{T} E'y cu'wugf 0

Vj g"gxcnwcvkqp"rtqeguu"hqt"cp{"pgy "f guki p"rtqegf wtg" uj qwrf " cnuq" eqo r ctg" f guki pu" cej kgxgf " wukpi " ewttgpv" r tqegf wtgu" y kj " y qug" qdvckpgf " wukpi " y g" pgy " r tqegf wtg0" Vj gtghqtg."c"eqo r ctkuqp"y cu"o cf g"dgw ggp" y g"r tgf kevgf " ugtxleg" dxgu" qh" y g" O p ITQCF " vguv' egmu" cu" f gvgto kpgf " wukpi "y g"O GRFI "cpf "qy gt "f guki p"o gy qf u0'K/y cu"hqwpf " yj cv." kp" i gpgtcn" yj g" O GRF I " v{r kecm{" r tgf kevu" ugtxkeg" nkxgu"hqt"yj kppgt"uncdu"*Kg0'yj g"OpfTQCF "7/{gct"vguvegm+" y cv"ctg"cu"mpi "cu"*qt"mpi gt"y cp+"y qug"f gxgmr gf "wukpi " qý gt" f guki p" r tqegf wtgu." cpf " ý cv" cm' qh" ý g" eqpukf gtgf " f guki p"r tqegf wtgu" wpf gtguvko cvgf " y g"r tqlgevgf "r gthqto / cpeg" nkxgu" qh" y gug" egmu0' Hqt" y g" y kengt" uncdu" *Kg0' y g" OpfTQCF "32/{gct "vguv"egm+."vj g"OGRFI "rtgf kevu"npi gt" ugtxleg" nkxgu" yj cp" yj qug" guvko cvgf "d{" yj g"3; ; 5" CCUJ VQ" r tqegf wtg." dww' uj qt vgt " nkxgu" yj cp" yj qug" guvko cvgf " d{" yj g" REC 'r tqegf wtg. "gxgp" y qwi j "c" j ki j gt "ngxgn'qh't gncdkrkv{

ku" kpeqtr qtcvgf " kp" yj g" REC" r tqegf wtg0' Hqt" o quv' f guki pu" eqpulf gtgf."y g"O GRF I "y qwf "tguwn/'kp"y kppgt"uncdu"y cp" y qwff "dg" qdvckogf " wukpi " y g" 3; ; 5" CCUJ VQ" r tgegf wtgu" *j qrf kpi "ugtxkeg" nkhg" eqpuxcpv+0' Wukpi " yj g" O GF RI " y qwrf " cnuq"tguwn/"kp"yj kppgt"f guki pu"yj cp"yj g"REC"r tqegf wtg"hqt" yj g"7/{gct"egmu."dwi'yj kengt"f guki pu"hqt"yj g"32/{gct"egmu0' Cnyi qwi j " yi g" O GRFI " uggo u" vq" qxgtr tgf kev" vtcpuxgtug" etcemkpi ."yj gtgd{"r tqxkf kpi "cp"qxgtn{"eqpugtxcvkxg"f guki p." k/'uvkm'r tqxkf gu"cp"cf gs wcvg."kh"pqv'cp"kor tqxgf."guvko cvg" qh" yj g" r tgf kevgf " ugtxkeg" nkhg" y j gp" eqo r ctgf " yg" y g" REC" cpf '3; ; 5'CCUJ VO'r tgegf wtgu0

Cempqy ngf i go gpw

Vj g" cwj qtu" y qwf " nkng" vq" i tcvghwm{ " cempqy ngf i g" vj g" Hgf gtcn" J ki j y c{"Cfo kpkuvtcvkqp" hqt" ku" hkpcpekcn" uwr r qtv0' Vj g" eqpvtk/ dwkqpu"qh"Ot"Lco gu"Uj gty qqf "cpf "Ou"Mcyj gtkpg"Rgxtqu"vq"yj ku" tgugctej "ghhqtv' ctg" i tgcvn{ "crrtgekcvgf 0' Vj g" cwj qtu" y qwrf "cnuq" nkng" vq"gz vgpf " vj gkt" i tcvkwf g" vq" O t" Vko qvj { "Enkpg" hqt" r tqxkf kpi " uqo g" qh" y g" r gthqto cpeg" f cvc" hqt" y g" O p ITQCF " vguv" ugevkqpu0' Hkpcm{."y g"cwj qtu"y qwf "nkng"vq"y cpm'O t"Ngx"Mj c| cpqxkej "hqt" r tqxkf kpi " yj g" enko cvke" f cvcdcug" cpf " kphqto cvkqp" qp" yj g" vtchhke" f cvc''wugf ''kp''vj ku''uwvf {0

Tghgtgpegu

- CTC."Kpe0"42260'I wkf g"hipt"o gej cpkurke"ó"go r kt/ecn'f guki p"qh'pgy cpf "tgj cdktkcvgf "r cxgo gpv'ut vewtgÈÁSá\↔~^á→ÁO~~*æãá\↔{æÁ Ò↔&å}á]ÁÞæbæáã´åÁŞã~&ãá↑ÊÁÚãá^b*~ã∖á∖↔~^ÁÞæbæáã´åÁ**Ñ€ÍÁÌÌÊÆ**€IËŞË€€€ÏHÈ Sá\↔~^á→ÁÞæbæáã´åÁO~|^´↔ÊÁÙábå↔^&\~^ÊÁŒOÈ
- Dctgpdgti ."GU0"gv"cnÊÁ G€€IÈÁ Tgxkgy "eqo o gpw"qp"y g"4224" OGFI "hqt" pgy " eqpetgyg" r cxgo gpul" r tgr ctgf " hqt" PEJ TR" 3/62C"*24+È
- Dgengo g{gt."E0"Mi c| cpqxkej ."N0"cpf"[w."V0"42240'F gygto kp/ kpi " co qwpv" qh" dwkn/kp" ewtrkpi " kp" lqkpvgf " r rckp" eqpetgyg" r cxgo gpvd Ecug" uwf { " qh" Rgppu{ nxcpkc" K: 20' Vtcpur qtvcvkqp" Tgugctej " Tgeqtf < ' Lqwtpcn' qh'' y g" Vtcpur qtvcvkqp" Tgugctej ' Dqctf ÊÁF΀ÏÊÁÎI½ÏGÈ
- Dwtpj co ."V0T0'cpf "Rktm" Y 00 0"3; ; 90'Crr necvkqp" qh" go r ktecn" cpf " o gej cpkuvke" go r kt/ecn' r cxgo gpv' f guki p" r tqegf wtgu" vq" OpfTQCF "eqpetgyg"r cxgo gpv'yguv'ugevkqpuÈÁÚæ´å^↔´á→ÁÞæ*~ã∖Á à~ãÁR⇔^^æb~\áÁŒæ*áã\↑æ^\Á~àÁÚãá^b*~ã\á\⇔~^ÊÁÞæ***~SchÁspeČtá**uejg."L0'cpf"Ow."H0"422;0'Gxcnvckpi"vjg"dvknv/kp" RSÐÞOËÏÍÐFHÈ
- D{two." E0" 42220' Cpcn{uku" d{" j ki j/ur ggf " r tqhkrg" qh" lqkpvgf " eqpetgyg" r cxgo gpv' uncd" ewtxcwtgu0' Vtcpur qt vcvkqp" T gugctej " Tgeqtf <Iqwtpcn'qh'ÿ g'Vtcpur qtvcvkqp'Tgugctej 'Dqctf ÊÁFÍĞ€ÊÁ F%ÏÈ
- Eqtgg." D0" 42270' Korngo gpvkpi " yj g" o gej cpkuvke" ó" gorktkecn" r cxgo gpv" f guki p" i vkf g<" Vgej pkecn" Tgr qt vÈÁ Ø~}áÁ U\á\æÁ Û^⇔{æãb⇔\]ÈÁÞæ*~ã\Á*ãæ*áãæäÁà~ãÁ\åæÁØ~}áÁÒ⇔&å}á]ÁÞ**æSoæ¢ášk**{**å¢**#" dwkn/kp" eqpuvtwevkqp" itcfkgpvu" cpf" gctn{/cig" Ñ~áãäÁÇØÒÞÑDÁŞã~↓æ´\ÁÚÞËI€ÏÈ
- I qvtkh "C0"O cmgrc. "L0" cpf "Mj c| cpqxkej . "N0"42280'Hkpkg" grgo gpv" uwuf { " qh" r ct vkcn/f gr yj " etcemu" kp" tguvt ckpgf " REE" uncdu0' Kpvgtpcvkqpcn'' Lqwtpcn'' hqt" Rcxgo gpv'' Gpi kpggtkpi ÊÁ ÍÁ ÇHDÊÁ ĞGĞÁ½ÁĞGÏÈ
- I wkgttg ."III0"422: 0'Gxcnwckpi "y g"IRER"etcenkpi "o qf gn"qh"y g" o gej cpkuvke"ó"go r ktkecnir cxgo gpvif guki p"i vkf gÊÁÚåæb⇔bÁà~ãÁ

\åæÁŒæ&ãææÁRáb\æãÁ~àÁU´↔æ^´æÁ↔^ÁO↔{↔→ÁÓ^&↔^ææã↔^&ÈÁ Û^↔{æãb↔\]Á~àÁŞ↔\\bâ|ã&åÈ

- J cm" MIF 0' cpf " Dgco ." U0" 42260' Gurko cvkpi " y g" ugpukkxkv{ " qh" f guki p" kpr w" xctkcdngu" hqt" tki kf " r cxgo gpv" cpcn{ uku" y kj " c" o gej cpkuvke" ó" go r ktkecn' f guki p" i vkf g0' Vtcpur qt vcvkqp" Tgugctej " Tgeqtf < Lqwtpcn' qh'' y g" Vtcpur qtvcvkqp" Tgugctej " Dqctf ÊÁFÏFÏÊÁIJ1½ÍĞÈ
- Lepuugp." FOO' cpf " Up{fgt." O (D0" 42220' Vgo r gtcwtg/o qo gpv" eqpegr v' hqt" gxcnxcvkpi " r cxgo gpv' vgo r gtcwtg" f cvc0' Lqwtpcn' qh" Kohtcustwewstg" U{uvgo u0' Co gtkecp" Uqekgv{" qh" Ekxki" Gpi kpggtuÊÁIJÁÇGDÊÁÚæ´å^↔´á→ÁS~\æÁS~ÈÁFÏÏHÎÈ
- Mcppgmcpvk"X0'cpf "J ctxg{."L0"42270'Ugpukkxkv{"cpcn{uku"qh"4224" f guki p" i wkf g" tki kf" r cxgo gpv" f kuvt guu" r tgf kevkqp" o qf gnuÈÁ ·{↔bÊÁONİÁÛ^↔{æãb↔\]Á~àÁOá→↔à~ã^↔áÈÁÞæ*~ã\Á*ãæ*áãæäÁà Oá→→à~ã^→áÁŒæ*áã\↑æ^\Á~àÁÚãá^b*~ã\á\↔~^È
- Mj c| cpqxkej ." N0' cpf " [w." V0" 42270' Ceeqwpvkpi " hqt" eqpetgyg" uj tkomci g" ko" vj g" o gej cokuske" ó" go r ktkech' r cxgo gov' f guki p" rtqegfwtg0'Kp<'I kmgu"Rklcwfkgt/Ecdqv."Dtwpq"I gtctf."cpf" Rcwn"Cengt."gfu0'Etggr."uj tkpnci g"cpf "f wtcdktkv{"qh"eqpetgvg" utwewtguÈÁÓ ´ ~→æÁOæ^ \ãá→æÁäæÁSá^ \æbÊÁÔãá^ ´ æİÁÒæã↑æbÁ U´↔æ^´æÁŞ|â→→bå↔^&ÊÁQ\äÊÁGÎÍÁ½ÁGÏGÈ
- Mj c| cpqxkej .'N0''gv'cnÊÁG€€FÈÁŒæ{æ→~*↑æ^\Á~àÁãá*⇔äÁb~→|\↔~^bÁà~ã *ãæä↔´\↔~^Á~àÁ´ã↔\↔´á→ÁOÞOŞÁb\ãæbbæbÈÁVtcpurqtvcvkqp" Tgugctej " Tgeqtf < Iqwtpcn" qh" yj g" Vtcpur qtvcvkqp" Tgugctej ' Dqctf ÊÁF Í Í Ê ÁIJH½ÍGÈ
- Mi c| cpqxkej. 'N0''gv'cnÊÁG€€ÎÈÁNäá*\↔~^Á~àÁRÓŞŒÖÁà~ãÁäæb↔&^Á~àÁ Vtcpur qtvcvkqp" Tgugctej " Tgeqtf < Lqwtpcn" qh" y g" Vtcpur qt/ vcvkqp'Tgugctej 'DqctfÊÁG€ÎÍÊÁIͽIJÍÈ
- Ow"HD"gv"cmÊÁG€F€ÈÁŞãæ*áãæÁá^äÁæ[æ´|\æÁáÁbæ^b↔\↔{↔\]Áá^á→]b↔ ↑~äæ→bÁ½Á\áb←ÁHÁBÁIÁäãáà\Áãæ*~ã\ÊÁÔÒÙNËŞã~↓æ´\ÁS|↑âæãÁ
- Rcent f. " T(I 0' cpf " Vc{cdlk" UF 0" 3; : 70' P gy " REC" y kenpguu" f guki p"r tqegf wtg"hqt"eqpetgyg"j ki j y c{"cpf "uvtggv'r cxgo gpuu0" Rtqeggf kpi u" qh" 5tf " Kpvgtpcvkqpcn" Eqphgtgpeg" qp" Eqpetgvg" Rcxgo gpv'F guki p"cpf "Tgj cdktkcvkqpÊÁŞ | ãä | æÁÛ^↔{æãb↔\]È
- Tcq."U0'cpf"Tqgurgt."L0T0"42270'Ej ctcevgtk kpi "ghhgevkxg"dvknv"kp" ewtrkpi "htqo "eqpetgyg"r cxgo gpv"hkgnf "o gcuwtgo gpw0'Lqwtpcn" qh"Vtcpur qt vcvkqp"Gpi kpggtkpi ÊÁFĞFÁÇHDÊÁĞG€Á½ÁĞGÍÊÁN↑æã↔´á^Á U~´↔æ\]Á~àÁO↔{↔^ææã↔^&È
- Xcpf gpdquuej g." LOO 0" 42250' Køvgtr tgvkpi "hcmkpi " y gki j v' f ghrge√ qo gvgt" tguwnu" hqt" ewtngf" cpf" y ctr gf" Rqt vcpf" ego gpv" eqpetgyg'r cxgo gpwÈÁÚåæb⇔bÁà~ãÁ∖åæÁŒæ&ãææÁŒ~´\~ãÁ~àÁ
- vgo r gtcwtg"f khhgtgpeg"kp"vj g"IRER"etcenkpi "o qf gn'qh"vj g"O/" GRFI 0' Køvgtpcvkqpcn' Lqwtpcn' qh' Rcxgo gpv' Gpi køggtkøi " Ç|^äæãÁãæ{↔æ}DÈ
- Xcpf gpdquuej g."LOO 0"gv"cnÊÁG€€ÎÈÁUgpukkxks{ "cpcn{ uku"qh'xctkqwu" fguli p'r ctco gygtu'hqt'IRERu'cpf 'ETERuÈÁÚæ´å^↔´á→ÁÞæ*~ã∖Á à~ãÁÔæäæãá→ÁÒ↔&å}á]ÁNä↑↔^↔b\ãá\↔~^È
- Y gm" U0C0" Rj knkr u." D0O 0" cpf " Xcpf gpdquuej g." L0O 0" 42280'
- und"uj cr g"vq" gpxktqpo gpvcn' mcf u" hqt" lqkpvgf "r nckp" eqpet gvg" r cxgo gpvu0'Kpvgtpcvkqpcn'Lqwtpcn'hqt"Rcxgo gpv'Gpi kpggtuÊÁ ÍÁ ÇHDÊÁGÍIÁ½ÁGÎÏÈ
- [w"V0"gv"cnÊÁFÏÏÎÈÁN^á→]b⇔bÁ~àÁ´~^´ãæ\æÁ*á{æ↑æ^\Áãæb*~^bæbÁ\ \æ↑*æãá\|ãæÁá^äÁ}åææ→Á→~áäbÁ↑æáb|ãæäÁàã~↑Á↔^b\ã|↑æ^\æä b→áâbÈÁ Vtcpur qtvcvkqp" Tgugctej " Tgeqtf < ' Lqwtpcn' qh" y g" Vtcpur qtvcvkqp'Tgugctej 'Dqctf ÊÁFIJĞÏÊÁÏH½ÁF€FÈ