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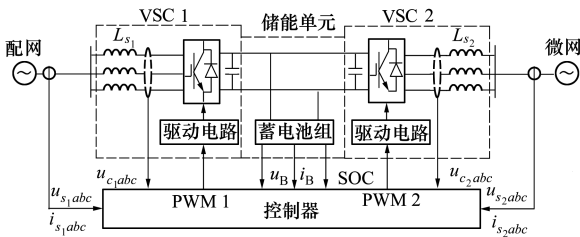
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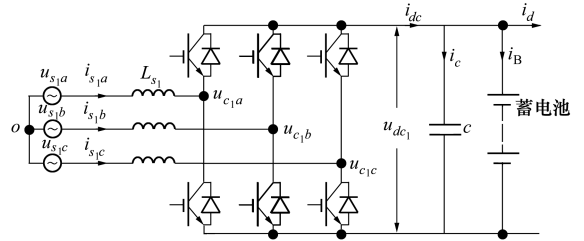


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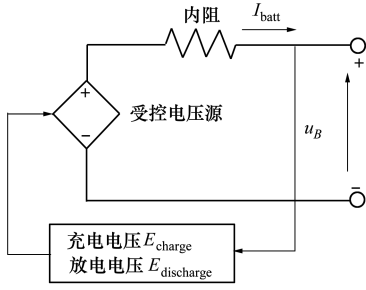
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$$u_{>} = E_1 - K \frac{Q}{Q - i_{> \%o}} i_{>}^M -$$
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$$\begin{cases} P_{k\phi} = u_{dcB} \frac{1}{\omega} \dot{i}_{dc} = -\frac{1}{\omega} u_s \dot{i}_{s\phi} \\ P_{1\phi} = u_{dc0} \frac{1}{\omega} \dot{i}_d = -\frac{1}{\omega} u_s \dot{i}_{s\phi} \\ P_{>} = u_{>} \dot{i}_{>} \\ P_{k\phi} = P_{>} - P_{1\phi} \end{cases} \%o$$

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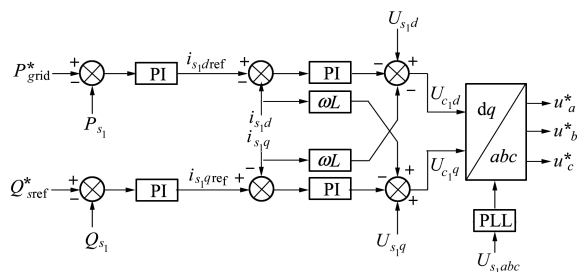
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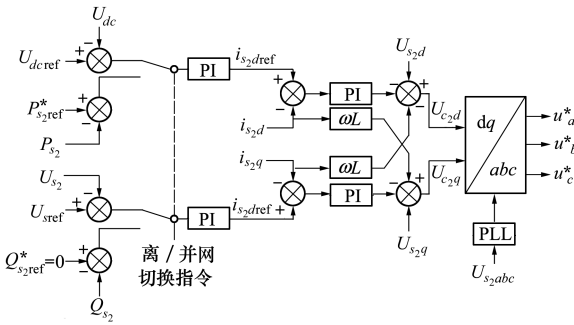
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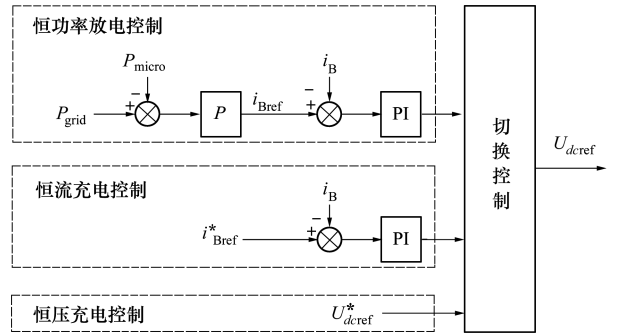
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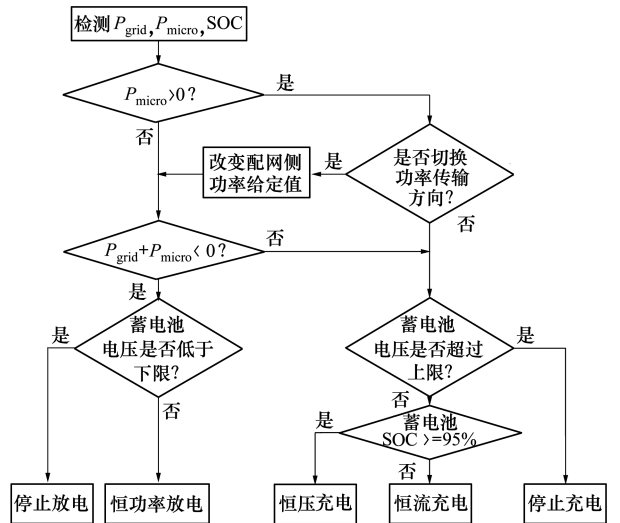


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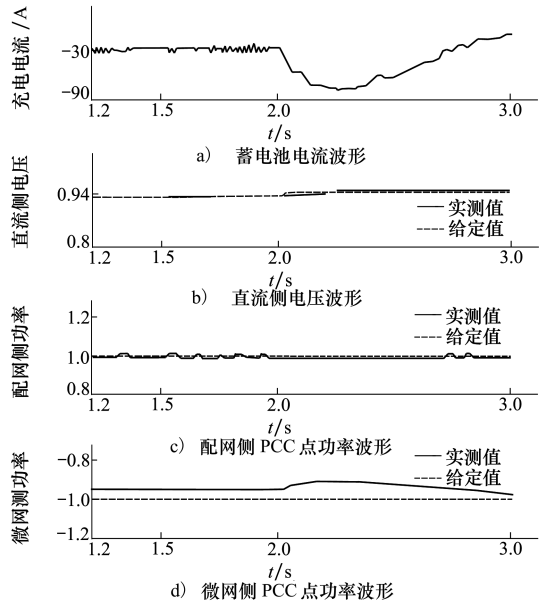
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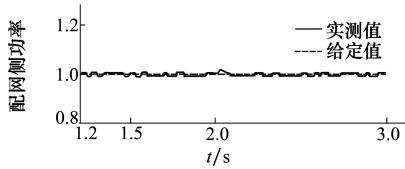
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Fz*b _i , • 1 N Ô*b _i , ðÆ	x!
Fz*b _i , • MÊÇ æFü ðXÆ	!ž
Û4~*b _i , 0v3ÔðÆ	x!
Û4~MÊÇ æFü ðXÆ	!ž
,! "n ÔMÊÇ*b _i , ðÆ	!!
9ñ*b _i • , €MÊÇ*b _i , ðÆ	ß0
9ñ*b _i • , €MÊÇ æFü ðd	ß!
9ñ*b _i • _5• W• ð,	"

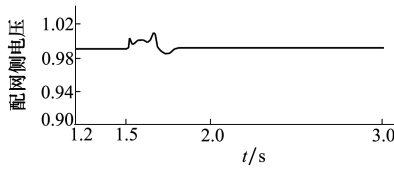
+ g P_{kø} > -P₁ < # "Fz4~Ô & Û4~Ô ± ì (' • 1 9ñ*b_i ! r *b_i % # ± ± " • % J ø % # "Fô *U9ñ*b_i ! • "n r *b_i æ < "9ñ*b_i ! r *b_i "n g !ö"9ñ *b_i ! J ø *bFü g xž " . "3üDô- â # K! r *b_i " € i % " . # "4 • g • , r *b_i " r *b_i , g !ž x" U Bæ %Dð8 Z "i . 7 t 'ä . "€ t) 0 # "i Dë] " . " # 3 • "n r *b_i æ < 4 • g • , r *b_i æ < "b_i , 4 Ç i ^ !ž 0C g !ž x" U 3üDô !ž ; ,! "n Ô*b_i , C K¼74 Ç i +U 4 • Dô /8 Z "b"n 6D° T ± C " r *b_i "n i Dë] @ ö " & c ; K¼9ñ*b_i ! *b_i , ± ± P " r *b_i "n E # = ü < "Dë] • ,) r 'ä . % € 9ñ*b_i ! r *b_i æ < E =y 4 • # "Fz4~Ô ME. ì (' WÔ*LC "59A ME. ì (' - ,! C K¼ Ç i "s Ô*L³ - Ç ± ±" Õ 59Û4~Ô Ò c ± ± ì (' < » Fz4~Ô ME. ì (' ì (' x K! ± ± MÊU » > 9ñ*b_i ! r *b_i "U r *b_i æ < E =y 4 • # " ^ » 9ñ*b_i ! r *b_i "n C "Û4~Ô Ò c ± ± ì (' Ô*L³ - Ç ± ±" Õ +U ; W %Dð8 Z Fz4~Ô ê %æ , - ,! . U ßž " "Í 6 Ô*L" Õ %



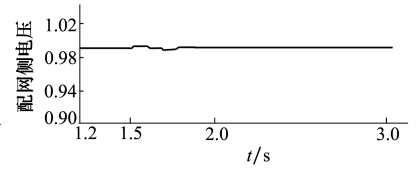
+ æP_{kø} ! q₁ < # "2(4 % " •
+ g P_{kø} q₁ < # "EGDô£4~ "n • > Û4~ DÆ. ì (' # ± ± ì (' " • % J ø % # "9ñ*b_i ! g • , r *b_i æ < "J ø *bFü g . "r *b_i , g !ž @ " € t % # "Û4~Ô @ Í BLD" - Ä P_{kø} q_x "ü 59 9ñ*b_i ! 4 • g • ì (' k *b_i " @ ì Û4~Ô ± ± ì (' =ž % € t 0 "9ñ*b_i ! 1 » r *b'ä . " # Fz4~Ô ME. ì (' • Ç "Û4~Ô Ò c ì (' < » Fz4~Ô DÆ. ì (' " 9ñ*b_i ! i . 7 t 'ä . " + € t 0 # "Û4~Ô m L- ì (' B²' Fz4~Ô ME. ì (' " # 9ñ*b_i ! * ^ r *b'ä . D T g k *b'ä . "i * ^ 7 t D T g 8 Kz "Fz4~Ô ME. ì (' : "59Û4~Ô Ò c ì (' ^ !ž 7 t] ßž x" B²' ± ± !ž x" ^ 9ñ*b_i ! ý È ì (' % + ß! g Û4~Ô p *L 6, % C r KÉ# "WX, ! " Õ6* ± ± £4~ Ò Fz4~Ô ê %æ ì (' ; ú 3i *b_i , " • % + Z t % ßž # Û4~Ô p *L 6, % C r KÉ" . 4 # K! g !ž ß0 %û + Z , 8 ' " € p *L 6, % - C r KÉ# "Fz4~Ô ê %æ ME. ì (' 8 Kz g ! "3ü DðÓ !ž ; • : ì (' ME. "A ú 3i *b_i , Ô*LD° T ± ± " Õ " Õ r ÓÓ g 0. % + ßß g £4~ "n • % » • , r *b MDÀN < " A Û4~Ô p *L 6, % C r KÉ# "X, ! "n Õ6* ± ± £4~ Ò Fz4~Ô ê %æ ì (' ; ú 3i *b_i , " • % € t % ßž # Û4~Ô p *L 6, % C r KÉ" . 4 # K! g !ž ß0 %û + Z , 8 ' " € p *L 6, % C r KÉ# "Fz4~Ô ê %æ ME. ì (' 8 Kz] !ž "3ü DðÓ !ž ; • : ì (' ME. "A ú 3i *b_i , Ô*L !ž . " Õ %



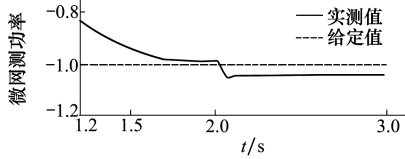
a) 配网侧 PCC 点功率波形



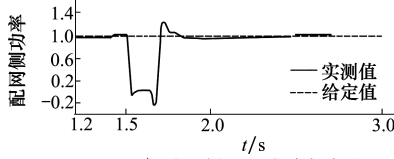
a) 配网侧 PCC 点电压波形



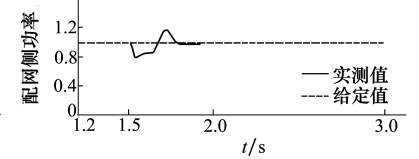
a) 配网侧 PCC 点电压波形



b) 微网侧 PCC 点功率波形



b) 微网侧 PCC 点功率波形



b) 微网侧 PCC 点功率波形

œœœ+ œP œœ Q' 1 œœ # "2(4 œœœœœœ+ ß œWX Ô6* , p # Û4~Ô r KÉFz + ßœœX Ô6* , p # Û4~Ô r KÉ Fz4~Ô*b ; ì (" •

œœ^ 7 3 ½ ,8 ' "X,! "n Ô6*+± T £4~ Ò EÐô&,! "n Ô*b , ±±Ô c "È(Ý ì (' ±±ME. 1 9ñ*b! • ±r k*b "U Û4~mL- 6 ì ì (' È Í # "Ô6* =ò4> ý È 6 ì "596 ì ì (' Kz{ # "Ô6*=ò4> e c 6 ì "È(Ý Û4~±± Ç Ô c " @Fz4~Ô±±ì (' • Ç " ¾c*b , " Ô %€ p*L 6,%- C r KÉ# "6* L ¾ Fz4~Ô ú3i*b , ±±" Ô "ü <Fz4~Ô ì (' " Ô r Ó " D° • : Fz4~Ô ê %æ±*b ; ì (' ME. "Bª] f ±*b6*BUFü±±%*U %

‡4 ‡@Ç

U 3 ½ Æ KÄE ò%! T ; Ô6*=ò4> %*U ±±-m7 "-A/£ ³ - .ú X,! "n Ô6*+± T £4~Ò " /ø ³ £ • " N , "È > • " N , ý ' ³ " »Kcâ r *b±±ù- FÜÔ c 0f* " Z ' ³ g Û4~£4~2(4 , ,L N , "È(Ý ³,! "n Ô Ô6* , p ±±r k*b ; ù0 ì (' MDÀÔ c " , ,L4 ÉA! ; EÐôÔ c Æ KÄE ±±! "n ú3i*b , "6* L È(Ý9ñ*b! • ±±r k*b "E - ' 6* L ¾ Û4~² ì (' " ÔEM=±±Fz4~Ô ê %æb ; ì (' " Ô " . Fz4~±±ì (' \$>"n 3 0 "ü <Û4~ £4~# &Fz4~EM=±±• Ô "59 A6* L 6 u KÁè Û4~ r KÉ"ü < Û4~r KÉ&Fz4~EM=±±ž ú %

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ßÔœ• Ý" "7ü~ " B S] "0v ŽÛ*b4~- \ 4)E .ÖŽZ * *b g /8 " Ò" 0! ßx" x%âoâ"®K
 _Uk î ÷iU i ü .±k" ÂZ; d=ç jk" wUŽ ù ð= • ç X=ùKk= ùð• •kf .ÖŽêøù ÷=k •i wd i66" 0! ßx" x%âoâ"®K
 ® %œ d=ç o
 0ÔœHü ø ø .• q X" dUk •ç Uç Xü"ü" Â ùk=ç" wUŽö"ùUkù > •çw öäü=wüüç •ççw ÷ çwX=ùKk= êUwç
 Ô ù çwU= > Uç @=çüü=iU •çw .ÖŽç66 çk •ç ç:ü wU 6 üw ç=ü" 0! ß " !%âoâß0" xK30 0
 Ôœ!(Û" %° " { "WÈ "0v ŽÁ & Û4~4ÑT>ñN Ò' ±±ç5•¹ ç Ö Ý æu ÷ J[- \ .ÖŽP *b , - \ " 0! ß" xß%ß! oâ ß K0!
 ê =ü ÷ Öü _Uç" Â=@çk" wUŽç"ü i •üw ç Uç ý f ùð• •kf •i çwäp çç üw ç Uç çwäUwç ; i •ç ÄUk i üU X=ç üw ç=ü ü wç çwKk=ç .ÖŽ@kd Æ wK 6çk= çk" 0! ß" xß%â! oâ ß K0! %œ d=ç o
 xÔœi=çkd @ ÆU d çUj Ž •] çUwü öçUf => w ç i X6i Uç >6i i ç öq ç=üUw ç ; Æ K@E if w] Ôœ0! ß" öççüU ç66 ç=ç •ç ç ç ç " 0! ß" â ßK
 "Ôœö" d=çUç" Â=èŽ •ç ç=Uw, ÆÉ Uç êK •çw •i •Uç êd•wü wü H ç çwç =ç Xêê Uç >Uwçf i wçk ç X=çK kç .ÖŽç66 çk •ç i] UwHç " 0! ß" "%oâ ß0® K30 ß
 Ôœœ' Dç"- Ý R "(ò "0v Žf ± Û*b4~M¾ / Ç T±±3 0 <E3 *b#½Ô c 0f* .ÖŽb - \ " Ò" 0! ß" !%âoâ ®K
 X çk .±k d=ç i d=ç üðç" ü Uç _= wUŽ •çw i çwKf •i Ô6• ççü çwç •ç ç ç=çk èç @ çüf i wB=çf •i X=çK=

.Öž dĵ Uu#z ğ dĵU6 ũw#wùdĵ=ùU i•ù=ŵf" 0!B" !%xoâ@ K@ %æ dĵ o
 @ÒœHüĴĵ _UŷĴĵ" AĴ@ .üĴĵ " Hü ŵ ŵ .• qX" wUžèç @ ĵŵfiwB=ŵf •! @= dĵd=ùU f •ĵw ŷ @f&ç èd•wù wĵèk
 >UwçfK@f çq çX=ùkç .Öžç66 dĵ •z çĵ ü ŵf öqq=ùU#z " 0!B" "B%oâx@ K@x0
 ÖœĴ "a" " •.í " M4»LKŽ ¾v <2(4 " Ö+±#5 Ö6* Öc0f*" .Öžb4-- \ " 0!B" "B%oâ0x"0K0x"
 üĴĵk @U#œ" _Ĵĵk î=î" ;dĴĵk X =Ĵžö •ĵw i wĴwĵf •! @f&ç 6z çkfiwĴk if w] ĴĴĴ •!iüqqç =k üwqūw
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 d ĵk ;dĴĴk" Â=ĵk•ĵk" î =ĵk=î" wUž •ĵw i wĴwĵf !•ç @f&ç 6z çkfiwĴk •! èd•wù wĵèH z dĴ#z X=ùk
 kç if w] =dĵiüç ç ĴĴĴ=ç .Öžè• çif w] ùdĵ••kf" 0!B" " %! oâ 0@ K@x" %æ dĵ o
 B Ö(Ĵ Ĵ f "Bk¼• " 0v Ž- .ú ¾Ū4-5•4 3i ì (" Ö+±*b!• ÷;‡ Ö6* | A0Öc0f*" .Öžž * *b g /8 " Ö" 0!B"
 "%! oâ" B0xK B x
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 X=ùkHç =ĴĴ= è• çè üŵüU#z .Öžèçü ŷ=ĵk •! wĵ i66" 0!B" " %! oâ" B0xK B x %æ dĵ o
 B BÖE 4 " ½! " { ' ¾" 0v ŽU » f ± Ñ"n2(4 - / Ç T±± AĒ K@Ā Ñ"n*b , qM¼ | A0Öc0f*" .Öžž * *b g /8
 " Ö" 0!B" " %! oâ @ K @
 Â=ü id ĵk" î ü ;d ĵk" Â=ü ĵŵz" wUžAĒ K@Ā ö AĒ wĵ Kçç @ ĵŵf ••ç=U#z ğ •ĵw i wĴwĵf !•ç çç qç=ĵk ö
 if w] dĵ =çwiwB=ŵf .Öžèçü ŷ=ĵk •! wĵ i66" 0!B" " %! oâ x @ K @ %æ dĵ o
 B ÖX•U U ö" X•üç=X i 6= î ± ü Žö;üĴĵ) èÜw# = K dçükd XĴĴĵ] çwiü d] !•ç AĒ K@Ā •z üwĵk !! d•ç
 =) èUĴĵ .Öžç66 dĵ •z è• çif w] " 0!B" " B%oâ x 0 K x
 B Ö6ç= d ç" è w d" id Ĵĵ kUèŽ6z dĴĵ) AĒ wĵ Öçq •ĵw &f AĒ K@Ā if w] !•ç çç qç=ĵk =) èUĴĵ èÜw# = K
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 BxÖ• ¼ Ä" • 5BŽU » T , ÖèçHMüb g±#5 , @Ā 2(4 Z ĵ "n • ±±' N ; Öc .Öžb - \ " Ö" 0!B" 0@%oâ
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 ;d•ü @ĵk= " _Ĵĵk H ĵkŽX> =k Ĵĵ , •ĵw !•ç • üw#ç=ç wĵ @f&ç K@Ā if w] !•ç ÖèçHK-U ŷ ü =) èUĴĵ .Öž
 dĵ •! dĵU6 ũw#wùdĵ=ùU i•ù=ŵf" 0!B" 0@%oâ 00x0 0 %æ dĵ o
 B" ÖĴĴ " idĵ .ü " @ŵçý ŽÖ =z Ĵĵ , q dĴ#z ğ! Ö=ü& iX6i =• !•ç AĒĴĴĴ è• çif w] dçükd AĒ K@Ā •z ĵk
 w#z .Öžç66 dĵ •z öqq=> iüç ç#z üŵüU#z" 0!B" 0 %! oâ "@ B !xK@ B !x
 B ÒE=A "Ĵ "a ¾Ž" » Ö6*=ò4)±± T,! "nDÀb - \ ý P T>ñNMüb2(4 / ÇDý=y6* È±±A/E .Öžb È2(4 Ñ ; Ö
 c " 0!B" " x0%oââK
 •Ĵ d ĵküd ĵk" üĴĵk @Ĵŵz Ž6z dĴĵ) çw# wĵ i wB q dĴ#z öç=ŵf •! ÂĴk KÜU ü =) è• çif w] >U ŷ •z wĵ
 AĒ K@Ā 6] & >> =ç 6z çkfiwĴk öqqĴĴĴ .Öžè• çif w] èd•wù#z Ĵĵ , •ĵw " 0!B" " x0%oââK %æ dĵ o
 B Ö=7Ü" r R" a f " 0v Ž0;~*b!• Ö6*2(4 8#b'ä . ±±6 ì ì (| A0Öc .Öžb È2(4 7 ÖC " 0!B" " %! oâ !K
 Ĵĵk è z" .Ĵĵk .=üüdü" ü ü ÖĴĵ" wUžö üw# è• ç ••ç=U#z , •ĵw •z =çzki •! >Uwçf 6z çkfiwĴk if w]
 .Öžöüw] U#z ğ! 6 üw#è• çif w] " 0!B" " %! oâ !K %æ dĵ o

t ãcã9-BJ s¥ ¬R÷,| ¬µ÷ YJ µ÷ ¥ã-Ve RYs-9Vã Ys
(B S-saã Yã RY9 Ye s• 9 B-sV• ÷s¥¥ãBã• Ys) → ã Sã-9Ys¥

i d ç X=jk" ; dUjk î ÷B&ç

%üç• •! öüw] U#ç" ¶•øw wç ê• fwüç=ñU ç=ç ç=ç" î =Üç @!@!" d=çB

Û çY-9Bã çç •ø çw ÷ qçù vB=çç •! val] èçkç •q çU# ç ù çç ùw) w >=ççüw ç w•ç" val ç• ç!•
! üüüU# ç Uç] ••val >Žçç val= çBç ç" U´ç) •! ; 4-& çwçü çç ü# ç çwçLü U wü=> ç val= çBç ç"
&U > •ç ù vçk •üü ü çü çwç • ù vçk >ç üwüçç ç%Æ KÄÄÖ o ù çvçç=çk ç çkf wçk Žöüçç=çk w
val] Uç] U#U] •) •! Æ KÄÄÖ Uç &Uwçç" U üU ü üwç) ùüç=çk valç K••q ù ççç valvçkf ù ç=w) •!
vçk üdUç=çk = çççç >" Uç val &Uwçç üdUç=çk Uç >=üdUç=çk =üç ü ççç = •! çç" !•ç üdUç=çk Uç
>=üdUç=çk •! val ç çkf wçk" val &ççç ü# çU çç çvçç] = çç Uç üççç çç çç çç üüüU# ç Žö ç ük
U# ç] •) = &ü=wçUw] èçkç çç çç ùw) w >=ççüw ç w•ç ü çç val ! 4-& çwçü çç ü# ç çwçLü" Uç
val ù çç) çç çç •! çç çç üüüU# ç" &Uwçç üdUç=çk Uç >=üdUç=çk =üç Uç val çççüü=ççLü wçwç] èçk
kçç = ö &ü Uç ç ü Uw) Ž d ç ü U# ç ç ü w ç valUwç ü ççç valvçkf !! ü# ç f üççç val çç ç
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B äe s-çã] èçkç + &Uwçç + Æ KÄÄÖ + çç çç üüüU# ç + kçç KÜ çç ùw)