

# **ARTS1691**

H\Y'l gY'cZ'@Ub[i U[Y

HYfa 'H\fYY''##'&\$&\$

## 7ci fgY<sup>-</sup>Cj Yfj ]Yk

## GHJZ7cbHJWh8YHJ]`g

## 7cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`]hm	@cWJhjcb	D\cbY
8YVfU <sup>-</sup> 5Ufcbg	X"UUfcbg4 i bgk "YXi "Ui	7 cbHJWha Y'Vm Ya U]`	,	D`YUgY WcbHUWfij]U YaU]`"

## GWXcc``7cbHJWhi±bZcfa Uh]cb

GW.cc``cZ<iaUb]h]Yg'UbX'@Ub[iU[Yg

@cWUhjcb. GWkcc`CZZJWYž'AcfjYb'6fckb'6i]X]b[ž'@YjY``&ž'&),

CdYb]b[ '< ci fg. 'A cbXUm! ': f]XUmž'- Ua '!') da

D\cbY. 'Ž\*%'&'-',)'%\*,%

: UI . Ž\*%'&'-',) ', +\$)

9a U]`. \<u>U`4 i bgk "YXi "Ui</u>

## 7ci fgY 8YHJ] g

## 7 fYX]hDc]bhg\*\*

### Gi a a UfmcZh\Y 7ci fgY

Mci 'k ]``Yl Ua ]bY`\ck 'WcbhYa dcfUfm`]b[i ]ghg`UXXfYgg`]ggi Yg`cZ`Ub[i U[Y`i gY"'Mci 'k ]``Yl d`cfY`hcd]Wg gi WX`Ug`h\Y`bUhi fY`cZ\i a Ub`Wca a i b]WUhjcbžh\Y`]bZi YbWY`cZgcWjU``Uhijhi XYg`cb``Ub[i U[Yž]fgh`UbX gYWcbX``Ub[i U[Y`UWei ]g]hjcb`UbX`XYj Y`cda Ybhžh\Y`\]ghcf]WU``XYj Y`cda YbhcZ`Ub[i U[Ygž'UbX``Ub[i U[Y i b]j YfgU`g`UbX``Ub[i U[Y'mdc`c[m'iMci 'k]```U`gc`Yl d`cfY`fY[]cbU``UbX`g]hi UhjcbU``j Uf]Uhjcb']b``Ub[i U[Y' Mci 'k]``\Uj Y`h\Y`cddcfhi b]hmhc`k cf\_'k]h\`UbX`UbU`mgY`fYU```]b[i ]gh]WXUhU''

### 7 ci fgY @YUfb]b[ Ci hWca Yg

%" 91 d`U]b`h\Y`gcW]U``UbX`fY[]cbU``X]a Ybg]cbg`cZ`Ub[i U[Y`j Uf]Uh]cb" &" 91 d`U]b`h\Y`a U]b`df]bW]d`Yg`cZ`]fghUbX`gYWcbX``Ub[i U[Y`UWei]g]h]cb`UbX`XYj Y`cda Ybh' (" 5bU`mgY``]b[i ]gh]WXUhU`UbX`Uf[i Y`h\Y`a Yf]hg`cZh\Y`UbU`mg]g"

#### HYUWX]b[ 'GhfUhY[]Yq'

#### FUhlcbU`Y.

 $\label{thm:condition} $$HY'WcifgY'dfcj]XYg'dUfficZUb']bffcXiWfjcb'fc'[YbYfU'']b[i]gfjWgz'ZcW'g]b['cb''Ub[iU[Y']b']fg'WcbfYIficZigY'''$ 

#### HYUW ]b[ Ghfuh / [] Yg.

 $H\Y''hYUWX]b[ 'ghfUhY[ ]Yg']bj c'j Y''YWhi fYg'UbX'hi hcf]U'g'''H\Y''hi hcf]U'g''UfY'XYg][ bYX'hc'ZcghYf']bX]j ]Xi U'dfcV'Ya 'qc'j ]b[ 'g_]``g'UbX'Yb[ U[ Ya Ybh']b'Wc'''UVcfUhj Y'hYUa k cf_"$ 

## 5ggYgga Ybh

## 5ggYgga Ybh'HUg\_g'

5ggYgga Ybh'tUg_	K Y][\h	8iY'8UHY	Gh XYbh@YUfb]b[ Ci hWca Ygʻ5ggYggYX
7`Ugg'hYgh'%'	')	\$+#%\$#&\$&\$`\$\$\$`5A	1
7`Ugg'hYgh'&'	')	%/#/%/#&\$&\$`\$\$\$`5A	%₹
: ]bU``Ugg][ ba Ybh	' \$1	&' #%#&\$&\$`%%\$\$`DA	%ž&Ž Ž(

## 5ggYgga Ybh'8YHJ]`g

5ggYgga Ybh% 7`Ugg'hYgh%

GhUfhXUhY. Bch5dd`]WUV`Y

8YHJ]`g.

G\cfhUbgk Yf]b!WUgg hYghž-\$a]bi hYg"

K f]hh/b 'UbX 'cfU` 'ZYYXVUW\_'k ]` 'VY 'dfcj ]XYX"

Gi Va ]gg]cb bchYg.H]a YX cb`]bY hYgh

 $Hi\ fb]hb\ gYhb[\ .\ H\]g\]g\ bchU\ Hi\ fb]hb\ Ugg][\ ba\ Ybh$ 

5ggYgga Ybh'& '7`Ugg'hYgh'&

GhUfhXUhY. Bch5dd`]WUV`Y

8YHJ]`g.

 $\verb|G\cfh'Ubgk Yf'] b! WUgg'h y ghž'-\$'a ] bi h y g''$ 

K f]hh/b 'UbX 'cfU` 'ZYYXVUW\_'k ]` 'VY 'dfcj ]XYX"

Gi Va ]gg]cb bchYg.H]a YX cb`]bY hYgh

Hi fb]hjb gYhjb[. H\]g ]g bchU Hi fb]hjb Ugg][ ba Ybh

5ggYgga Ybh' .: ]bU` Ugg][ ba Ybh

GhUfh'XUhY.

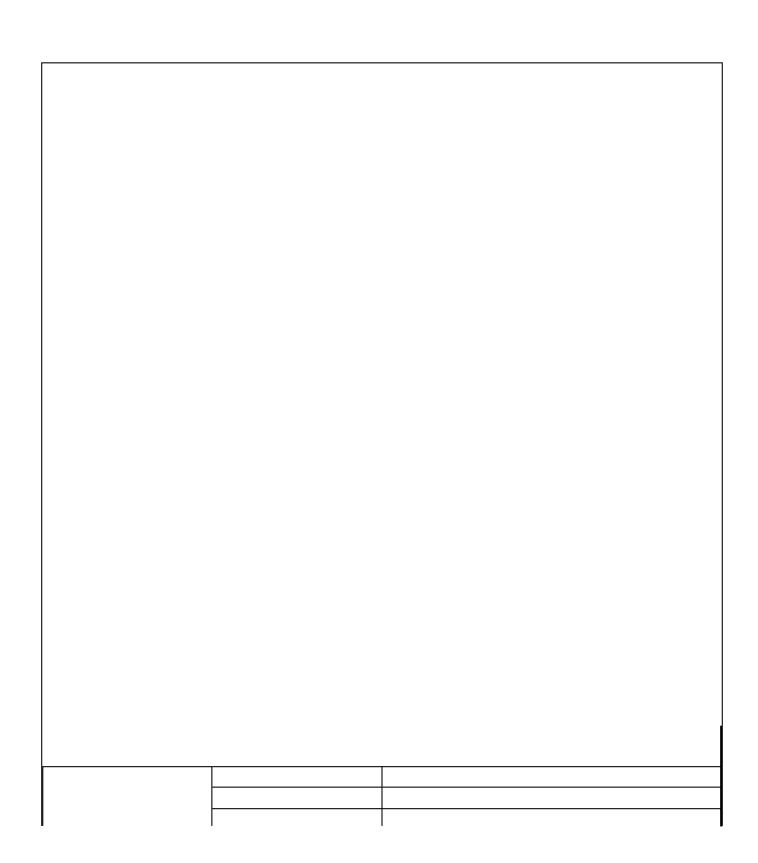
8 YW] g.

%) \$\$`k cfX`Ugg][ ba Ybhcb``]b[ i ]gh]Wg`dfcV`Ya g"

Gh XYbhg fYVW] Y'k f]hhYb ZYYXVUW\_"'H\]g ]g h\Y Z]bU``Ugg][ ba YbhZcf UggYgga Ybhdi fdcgYg"

Gi Va ]gg]cb bchYg.gi Va ]hcb`]bY

 $\label{thm:continuous} \begin{tabular}{ll} Hi fb]h]b"gYh]b"[."H\]g"Ugg][ba Ybh]g"gi Va]hhYX"h\fci [\Thi fb]h]b"UbX"ghi XYbhg"WUb"gYY"Hi fb]h]b"g]a]"Uf]hm fYdcfhg" \\ \begin{tabular}{ll} Hi fb]h]b"gYh]b"[."H\]g"Ugg][ba Ybh]g"gi Va]hhYX"h\fci [\Thi fb]h]b"UbX"ghi XYbhg"WUb"gYY"Hi fb]h]b"g]a]"Uf]hm fYdcfhg" \\ \begin{tabular}{ll} Hi fb]h]b"gyhh]b"[."H\]g"Ugg][ba Ybh]g"gi Va]hhYX"h\fci [\Thi fb]h]b"UbX"ghi XYbhg"WUb"gYY"Hi fb]h]b"g]a]"Uf]hm fYdcfhg" \\ \begin{tabular}{ll} Hi fb]h]b"ghi fydghi fydghi$ 



	- 3 -	K UHWX 'gY`YWMYX'Mci hi VY'j]XYcg'UbX'Wca d`YhY cb`]bY'UWNjj]hjYg
K YY_''- 'Bcj Ya VYf'! % 'Bcj Ya VYf	5ggYgga Ybh	7`Ugg`HYgh'&'kcfh\'')ı 'hc'VY'hU_Yb'cb`]bY'Xif]b[ 'YWhifY'h]aY"''
	@YWhifY	±blfcXiWfjcbihcKfjhjb[GmghYag7\UdhYf3&
	Hi hcf]U`	7 \ UdhY f' %\$
K_YY_'%\$.'%* 'Bcj Ya VYf'!	@YWhifY	K f]h]b[ 'GmghYa g'7 \UdhYf'‰
&\$^Bcj Ya VYf	Hi hcf]U`	K f]h]b[ 'GmghYa g'7 \UdhYf'‰

## FYgci fW/g

## DfYgWf]VYX F Ygci fWYg

## FYWca a YbXYX FYgci fWYg

 $: ]bY[\ Ub\check{z}`9"`@Ub[\ i\ U[\ Y. \ $^\sharp g`Gffi\ Whi\ fY`UbX`I\ gY"`\&$\%("`+h\ `9X]h]cb"`7Yb[\ U[\ Y. \ $^\sharp g`Gffi\ Whi\ fY`UbX`I\ gY"`&$\%("`+h\ `9X]h]cb"`7Yb[\ U[\ Y. \ $^\sharp g`Gffi\ Whi\ fY`UbX`I\ gY"`&$\%("`+h\ `9X]h]cb"`7Yb[\ U[\ Y. \ $^\sharp g`Gffi\ Whi\ fY`UbX`I\ gY"`&$\%("`+h\ `9X]h]cb"`7Yb[\ U[\ Y. \ $^\sharp g`Gffi\ Whi\ fY`UbX`I\ gY"`&$\%("`+h\ `9X]h]cb"`7Yb[\ U[\ Y. \ $^\sharp g`Gffi\ Whi\ fY`UbX`I\ gY"`&$\%("`+h\ `9X]h]cb"`7Yb[\ U[\ Y. \ $^\sharp g`Gffi\ Whi\ fY`UbX`I\ gY"`&$\%("``+h\ `9X]h]cb"``7Yb[\ U[\ Y. \ $^\sharp g`Gffi\ Whi\ fY`UbX`I\ gY"``&$\%("``+h\ `9X]h]cb"```7Yb[\ U[\ Y. \ $^\sharp g`Gffi\ Whi\ fY`UbX`I\ gY"``&$\%("``+h\ `9X]h]cb"`````$ 

9h\bc`c[iY

HY'K cfX'5hUg'cZ@Ub[iU[Y'GhfiWhifY'Cb']bY

### 7ci fgY 9j U`i Uh]cb UbX 8Yj Y`cda Ybh

7 ci fgYgʻUfYʻdYf]cX]WU`mfYj ]Yk YX`UbX`ghi XYbhg'ʻZYYXVUW\_`]gʻi gYX`hc`]a dfcj Y`h\Ya "`

: YYXVUW\_`]g`[ Uh\YfYX`Zfca `ghi XYbhg`i g]b[ `a m9I dYf]YbWY"`Ghi XYbhg`UfY`YbWci fU[ YX`hc`Wca d`YhY`h\Y]f gi fj Ymg`VmUWWYgg]b[ `h\Y`dYfgcbU`]gYX`k YV``]b\_`j ]U'h\Y`A ccX`Y`Wci fgY`g]hY''`

## Gi Va ]gg]cb cZ5ggYgga YbhHUg\_g

## Hi fb]h]b Gi Va ]gg]cb

Image: Ybwei bhyfu'dfcv'ya k \yb'uhhya dhjb[ 'hc'gi va ]hmci f'Ugg][ ba Ybhh\fci [ \ 'Hi fb]h]bž'd'YUgY

Hy'Yd\cby'9| hy'fbu''Gi ddcfhcb'-', ) '' ' ' %cf'Ya U]''h\Ya 'cb'Y! hy'fbu'hy'hgi ddcfh4 i bgk "YXi "Ui "''Gi ddcfh
\ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY\_XUmg'UbX'-.\$\$Ua '-').\$\$da 'cb'k YY\_YbXg'fl \*) 'XUmg'U'mYUft'''=Z'mci
UfY'i bUV'Y'hc'gi va ]hmci f'Ugg][ ba YbhXi Y'hc'U'ZJi 'hk ]h\ 'Hi fb]h]b'mci 'a Um'Udd'mZcf'Ub'Y! hy'bg]cbž'Vi hmci
a i ghfYhJ]b'mci f'h]W\_Yhbi a VYf'Zfca '9! hy'fbU''Gi ddcfhfU'cb[ 'k ]h\ 'Ubmch\Yf'fy'Yj UbhXcW a Ybhgt'hc
]bWi XY'Ug'Yj ]XYbW' hc'gi ddcfhmci f'Y! hy'bg]cb'Udd']WUh]cb"'=Zmci 'Ya U]''9! hy'fbU''Gi ddcfhmci 'k ]'`
Ui hca Uh]WJ'`mfYW']j Y'U'h]W\_Yhbi a VYfZ'Vi h]Zmci 'hY'Yd\cbY'mci 'k ]``bYYX'hc'gdYW]Z]WJ'`mUg\_'Zcf'cbY''
Hi fb]h]b'U'gc'dfcj ]XYg'i dXUhy'g'cb'h\Y]f'gmghYa 'ghUh' g'cb'Hk]hyf''

; YbYfU`mž'UggYgga YbhiHug\_g'a i ghVY'gi Va ]hhYX'Y`YVWfcb]\WJ``mij ]U'Y]h\Yf'Hi fb]h]b'cf'U'A ccX`Y Ugg][ ba Ybh''=b']bgHJb\W'g'k \YfY'h\]g']g'bchdcgg]V`Yž']hk ]```VY'gHJhYX'cb'mci f'\\circ i fgY'g'A ccX`Y'g]hY'k ]h\U`hYfbUh]j Y'gi Va ]gg]cb'XYHJ]`g"

cfi]bZcfa Uhjcbicbi\ckihcigi Va ]hUgg][ ba Ybhgicbi]bYij ]UiA ccXiY.i\hdg.#gh XYbhi bgk "YXi "Ui #\ck! gi Va ]hUgg][ ba Ybha ccXiY

## 5 WUXYa ]W<cbYghmUbX D`U[]Uf]ga

D`U[]Uf]ga i]gii g]b[ih\Yik cfXgicfi]XYUgicZch\YfgiUbXidfYgYbh]b[ih\Ya iUgimci fick b"i=hWJbihU\_Yia Ubm Zcfa gžZfca iXYi]VYfUhYiWXYUh]b[ihciUWW]XYbhU`mWcdm]b[iZfca iUigci fWYik]h\ci hiUW\_bck iYX[Ya Ybh'

IBGK [fcidg'd'U[]Uf]ga ]bhc'h\Y'Zc``ck]b['WUhY[cf]Yg.

- i bXYfgfUbX mci f'f][\hg'UbX'fYgdcbg]V]`]hJYg'Ug'U'gh XYbhUhl BGK
- VY`Uk UfY`cZd`U[]Uf]ga ž`Wcdmf][\hz'l BGK `Gh XYbh7cXY`cZ7cbXi WhUbX`5VWWdhUV`Y`l gY`cZ I BGK `=\forall H`F Ygci f\W\g`Dc`]\m\m
- VY 'Uk UfY 'cZh\Y 'ghUbXUfXg 'cZVY\Uj ]ci f'Yl dYWYX 'cZYj YfmcbY ']b 'h\Y 'l BGK 'Wca a i b]hm
- `cWUHY'qYfj |WYq'UbX']bZcfa UHcb'UVci hi BGK 'UbX'l BGK '@|VfUfm

Gca Y'cZh\YgY'UfYUg'k]``VY'ZJa]`]Uf'hc'mci ž'ch\Yfg'k]``VY'bYk"'; U]b]b['U'gc`]X'i bXYfgHJbX]b['cZU``h\YfY`UhYX'UgdYWng'cZ9@+69'k]``\Y`d'mci 'a U\_Y'h\Y'a cghicZmci f'ghi X]Yg'UhI BGK "'\\hd.##qi VYWfi |XYg"`]VfUfm'i bqk "YXi "Ui #\`]qY#JVci hY`]qY

5 WUXYa]W±bZcfa Uhjcb