# DYdUfh a Ybh cZ P\mg]Wg Cc``Y[Y cZ Afhg UbX SW]YbWYg

#### FUW i hm

? mY@ < Ux WM (1-+(-,,, 1--(). I b); YfglmDfcZyggcf cZD\nglWy 8 YdUfha Ybh7\Uf, UX5 ggcWUfy 8 Yb cZ5 flgUbX GWMbWg 6.G UbXD\.5A  $6 \quad 5 ggc WLHX$ Α 3®

#### Ciff]Wi`ia

H\Ydfc[fLag]bd\nglVgLhIb]cbIb]jYfg|mgYY\_hcYZXVkjjYmgYfjYU`gliXYbgk]h\]bh\Y]bgl]h ljcb,fYVv[b]n-]b[h\thYUW gli XYbhŷbYYXga UmVY X]ZXfYbh k ]h X]ZXfYbhWfYYf [cUg H\YWff]W`i a ]gXYg[[bYX hc dfcj ]XY WgWwbhhbhZcf gli XYblgWUggÚYXUgd\ngWga Ucfg/a ]bcfg bcb-gWbWa Ucfg Yb[]bYYfg dfY-dfcZygcbUg UbX Н

- = A Ucf ]b D\ng]Vg{ 3, gYa YghYf \ci fg
- 5.  $D \ge 1232, 2*2, 311, 313, 31(, (30, (2(-), (-, -))))$
- 6. GYYM11,  $\ \ B = M2^{*}2$ , 313, 31(, 32), 3\*0, 3·) \*, (00, (10, (20, (-)
- 7. DfYfYei |g|hYg|b A Uh. 211, 212, 213, 31( \*A i ghVYUddfcj YXGdYVJU GhiXJYg
- = A Ucf |b 9b[ |bYYf|b[ D\ng Vg 73gYa Yghf \ci fg
  - 5. DfYfYei lgllyg 7< 9 111, 113/7G7 11) /7G7 2() cf 2) /97: 211/A 5H211, 212, 213, 31(/A 5H31) cf 20,
  - 6. D< M231, 232, 311, 313, 31(, 32), (00Í 2\* \ci fg
  - 7. 9; F 101, 10, 210, 2, 0, 2+0, 2+), 2-0, 3(3, 3) 2/(20 cf () 0/20) cf (+0/(-1, (-, Í (0 \ci fg
  - 8. 9;  $F/D < M2^* 2 UbX9$ ;  $F/D < M3^* 0 I + ci fg$
  - 6. DfcZ/gg]cbU 9Xi Which. 98I 1) 0, 2) 0, 32\*, (1, , (33, DGM213, 31, , G9 22). 9. 91 Ya dhZf 9

7. 7ca d`YhYh YUdd`]WWYdcfhcbgcZh YDfU ]g=

8. : cf UXX]hcbU ]bZcfa Uhcb, gYYh Y5 gg]glUbh8 YUb Zcf HYUWYf 9Xi Which UbX5 WAYX]hLhcb.

#### AggYgg a Ybh cZ MU<sup>^</sup>cf

5 ``D\ngWga UcfgUfYfYei |fYXhcHU\_YUfYgYUfW WLgg D< M(2(, UbXUgYa |bUf WLgg D< M(-,, |bk \]W dfYgYb-HulcbgUYa UXYUbXgli XYblgUYei YglcbYXcfU`mGYblcfga i ghUgcHU\_Yh\YA Ucf: |YX9|Ua |bUlcb |bd\ng\Vg UbX |ZgYY\_|b| hYUWYf`|Wbgi fY, Wa d`YhYh YfYei |fYX YXi Which hYgiggi W UgDF5L=G

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## ShiXYbh Of [Ub]nUh]cbg

H\Y**GC\/MmcZD\ng\VgChiXYblg(CDC)** gl]a i `Uh'gUb Uk UYbYggcZd\ng\VgUbXh\YfYUhXg\/MbWg UbXU&i UJblg gliXYblgk ]h\dfcZ/gg]cbU cddcflib]hYgk ]h\]bh\YX]g\/d`]bY.H\Ycf[Ub]nUhcbdfca ch'gdfcZ/gg]cbU]ga UbXdf]XY ]bh\Yd\ng\VgUbXVgUbXUgg]gggiiXYblg]bgiiXnjb[,dfYdUf]b[,UbXdfYgYbh]b[ hWVb]Wa Uhf]U.A Ya VYfg\]d ]gcdYbhcUbmgiiXYbh]bhfYghXX]bd\ng\Vg

## ShiXYbh AkUfXg

H Y D ng/VgF VgYUFW 5k UFX]g[]j Yb Vmh YZUW ImcZh Y 8 YdUfha YbhcZD ng/Vghc h Y gi XYbhk \c dfYgYblg h YVYghfYgYUFW dUdYf cZh YmYUF. H YfYgYUFW a i gh \U YVYb Ub cf][]bU k cf\_UbXa i ghVYdfYgYbhXUhUgUH, fY[]cbU, cf bU}cbU dfcZ/gg]cbU a YYhb[ df]cf hc h Y[ fUXi U}cb.

## CcifgY OZZYf]b[g]b P\mg]Wg (PHM)

() < ci fg7fYX]h': -: U`/K -K ]bhhf/G-Gdf]b[/Gi -Gi a a Yf

#### 111. Df]bV/d`YgcZh YD\ng/W/GV/MbV/g(4):, K, G, Gi

=blfcXi Wijcblrcd\nglWgUbXWYa]gfmi2cfbcb-gWybWaUcfg]bWiX]b[h\Y]f\]ghcf]W,d\]`cgcd\]W,UbXgcVJUg[b]ÚWbW.91YfVgygUY]bX]WljjYcZjUf]ciggWybljÚWaYhcXg?bck`YX[YcZVUgWU[YVfU]gUgjaaYX.GWybWVWX]h k]``bchVY[]jYbUZhfWad`YljcbcZUWifgY]bY]h\Yf7<9cfD<MH\fYY`YMifYgcbY2-\cif`UvcfUrcfm/kYY\_.

#### 112 9Ufh UbXGdUWGVJWbW(4):, K, Gi

DfYfYei ]g]hY. D< M111. FYYJdfcW/ WYX]h; 9C 112.

90 Fh gW/MbW UbX Ugfcbca m h Ylf bUi fY, \]ghcfm Xlj ]ghcbg UbX fYUljcb hc ch Yf gW/MbWg H Yd \ng W `Uk g cZ bUi fYk ]`` VY Yl Ua ]bYX Ugh YmUdd`mhc d \ng W [Yc[fUd \ma Yh/cfc`c[m,UbX Ugfcbca m H fYY `WM fYg cbY 2- \ci f`UVcfUrcfm/k YY\_.

### 2134 =blfcXi Wijcb hc D\ng/Wg(4) 213í : ÌCXX, 214í GÌ9j Yb

DfYfYei]g|hY.A 5H111-2.

 $\label{eq:hamiltonian} \begin{array}{l} H & Y & \label{eq:hamiltonian} H & \label{eq:ham$ 

## 231-2 I b]j YfghmD\ngWg=, =k]h\7UW`i g(5) 2311 :, 2321 G

DfY- cf 7 cfYei ]ghY. A 5H211-2.

H\YÚfghgYa YgYuf]bjcjYgh\YghiXmcZWLggWVa WWb]WgkUjYa chlcb,Ûi]XÛckUbXgcibXH\YgWvbX]bjcjYg h\YghiXmcZhYa dYfUhifYUbX\YUhYYMf]VJmaU[bYhga,`][\hUbXcdh]Wg:cifYWaffXgcbY`UvcfUrcfmrkYV\_.

#### 262 =blfcXi Witfm9`YWifcb]Wg(4) GÍ CXXMIUfg

DfYfYei ]g]hY. A 5H212 FYV/dfcWJ VAYX]h 9; F 2\*2 GYY9; F 2\*2Zcf XYgV/]dl]cb.

#### 301. DMfgdYMjjYg]bGVMbW(4):, K

DfYfYei ]ghY. D< M111-2. FYV/dfcW/ WYX]h 7< 9 301.

## 310 9bYf[m9bj]fcbaYbhUbXGcV/Mm(4)K,G

DfYfYei ]g]hY. D< M111.

5 bcb-hWb]W Wi fgYZcf h Y [YbYfU głi XYbhdfYgYbl]b[ UVfcUXj ]Yk cZYbYf[ mLbX]lgfYU]cbg\]d hc a Ub UbXh Y Ybj ]fcba Ybh Hcd]Wg dUghUbXZ hi fYXYa UbXg YbYf[ mgci fWg ghcfU YUbXlfUbgdcffU]cb cZYbYf[ mYbj ]fcba YbH Wbg]XYfU]cbg WbgYfj U]cb, dc`]hJWg YWbca ]Wg UbXbU]cbU dc`]WnH\fYY YWi fYg 3`UV\ci fg/ k YY\_.

## 311. I b]j YfghmD\nglVg A cXYfb D\nglVg(4): Í 9j Yb Mt(fg

DfYfYei ]g]hY. A 5H212 & D< M232.

5b ]bhfcXi Wijcb hc gdWjU fYUlji ]hm ei Ubli a a WWUb]Wg Ubca ]WUbX bi WYUf d\ngJWg H\Y`UVcfUbcfm]bj c`j Yg

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