



Pontifícia Universidade Católica de Minas Gerais (Unidade São Gabriel)

Programa de Pós-graduação – Mestrado em Informática

Disciplina: Fundamentos Teóricos da Computação

S → 0531P1λ

P → 1P21λ

PUC Minas

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## Exercícios Extra (2ª AVALIAÇÃO – 1º sem/2015)

Nome: \_\_\_\_\_

- 1) Construa AP (apenas o diagrama) e GLC para as seguintes linguagens:

$$\begin{aligned} ① \quad S &\rightarrow E a E \\ E &\rightarrow \lambda \mid a E b E \mid b E a E \end{aligned}$$

a)  $L_1 = \{ w \in \{a, b\}^* \mid n_a(w) - 1 = n_b(w) \}$ , em que  $n_s(w)$  é o número de símbolos  $s$  em  $w$  (04 pontos)

b)  $L_2 = \{ a^n b^{2n} c^k \mid n, k \geq 0 \}$

②  $S \rightarrow A B$  (04 pontos)

$$A \rightarrow a A b b \mid \lambda$$

$B \rightarrow b c \mid \lambda$  (04 pontos)

c)  $L_3 = \{ a^m b^n c^k \mid m \geq n \text{ ou } n \leq k \}$   $X_0 \rightarrow X_1 X_2$

$$\begin{aligned} X_1 &\rightarrow S C & S &\rightarrow a S b \mid A \\ A &\rightarrow A a \mid \lambda & C &\rightarrow C c \mid \lambda \end{aligned}$$

$$X_2 \rightarrow H P$$

$$P \rightarrow b P c \mid \bar{E}$$

$$Z \rightarrow C c \mid \lambda$$

$$H \rightarrow A a \mid \lambda$$

$$E \rightarrow \lambda$$

$$\Sigma \rightarrow \lambda$$

$$i \rightarrow \lambda$$

- 2) Considere a seguinte GLC  $G = (\{P, A, B\}, \{a, b\}, R, P)$ , em que  $R$  contém as seguintes regras:

$$P \rightarrow RS$$

$$R \rightarrow AR \mid \lambda$$

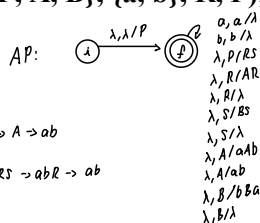
$$S \rightarrow BS \mid \lambda$$

$$A \rightarrow aAb \mid ab$$

$$B \rightarrow bBa \mid \lambda$$

$$P \rightarrow RS \rightarrow R \rightarrow AR \rightarrow A \rightarrow ab$$

$$P \rightarrow RS \rightarrow ARS \rightarrow abRS \rightarrow abR \rightarrow ab$$



Pede-se :

- a) Construa um AP (apenas o diagrama) que reconheça  $L(G)$ ; (03 pontos)

- b) Mostre que  $G$  é ambígua.  $G$  é ambígua por existir duas derivações diferentes para a frase:  $ab$  (03 pontos)

- 3) Considere a linguagem  $L_{\text{QUAD}} = \{ a^{n^2} \mid n \geq 0 \}$ . Mostre que ela não é LLC. (04 pontos)

- 4) Sabendo que  $L_{\text{QUAD}}$  (da questão 3) não é LLC, mostre se a linguagem a seguir é ou não LLC

$$L_{\text{QUAD-B-PAR}} = \{ w \in \{a, b\}^* \mid n_a(w) \text{ é um quadrado perfeito e } n_b(w) \text{ é par} \},$$

em que  $n_s(w)$  representa a quantidade de símbolos  $s$  presentes na palavra  $w$ . (03 pontos)

$$\{a\}^*$$

$$\lambda, a^1, a^2, a^3, a^4, a^5, a^6, a^7, a^8, a^9, a^{10}, a^{11}, a^{12}, a^{13}, a^{14}, a^{15}, a^{16}, a^{17}, a^{18}, a^{19}, a^{20}, a^{21}, a^{22}, a^{23}, a^{24}, a^{25}, a^{26}, a^{27}, a^{28}, a^{29}, a^{30}, a^{31}, a^{32}, a^{33}, a^{34}, a^{35}, a^{36}, a^{37}, a^{38}, a^{39}, a^{40}, a^{41}, a^{42}, a^{43}, a^{44}, a^{45}, a^{46}, a^{47}, a^{48}, a^{49}, a^{50}, a^{51}, a^{52}, a^{53}, a^{54}, a^{55}, a^{56}, a^{57}, a^{58}, a^{59}, a^{60}, a^{61}, a^{62}, a^{63}, a^{64}, a^{65}, a^{66}, a^{67}, a^{68}, a^{69}, a^{70}, a^{71}, a^{72}, a^{73}, a^{74}, a^{75}, a^{76}, a^{77}, a^{78}, a^{79}, a^{80}, a^{81}, a^{82}, a^{83}, a^{84}, a^{85}, a^{86}, a^{87}, a^{88}, a^{89}, a^{90}, a^{91}, a^{92}, a^{93}, a^{94}, a^{95}, a^{96}, a^{97}, a^{98}, a^{99}, a^{100}, a^{101}, a^{102}, a^{103}, a^{104}, a^{105}, a^{106}, a^{107}, a^{108}, a^{109}, a^{110}, a^{111}, a^{112}, a^{113}, a^{114}, a^{115}, a^{116}, a^{117}, a^{118}, a^{119}, a^{120}, a^{121}, a^{122}, a^{123}, a^{124}, a^{125}, a^{126}, a^{127}, a^{128}, a^{129}, a^{130}, a^{131}, a^{132}, a^{133}, a^{134}, a^{135}, a^{136}, a^{137}, a^{138}, a^{139}, a^{140}, a^{141}, a^{142}, a^{143}, a^{144}, a^{145}, a^{146}, a^{147}, a^{148}, a^{149}, a^{150}, a^{151}, a^{152}, a^{153}, a^{154}, a^{155}, a^{156}, a^{157}, a^{158}, a^{159}, a^{160}, a^{161}, a^{162}, a^{163}, a^{164}, a^{165}, a^{166}, a^{167}, a^{168}, a^{169}, a^{170}, a^{171}, a^{172}, a^{173}, a^{174}, a^{175}, a^{176}, a^{177}, a^{178}, a^{179}, a^{180}, a^{181}, a^{182}, a^{183}, a^{184}, a^{185}, a^{186}, a^{187}, a^{188}, a^{189}, a^{190}, a^{191}, a^{192}, a^{193}, a^{194}, a^{195}, a^{196}, a^{197}, a^{198}, a^{199}, a^{200}, a^{201}, a^{202}, a^{203}, a^{204}, a^{205}, a^{206}, a^{207}, a^{208}, a^{209}, a^{210}, a^{211}, a^{212}, a^{213}, a^{214}, a^{215}, a^{216}, a^{217}, a^{218}, a^{219}, a^{220}, a^{221}, a^{222}, a^{223}, a^{224}, a^{225}, a^{226}, a^{227}, a^{228}, a^{229}, a^{230}, a^{231}, a^{232}, a^{233}, a^{234}, a^{235}, a^{236}, a^{237}, a^{238}, a^{239}, a^{240}, a^{241}, a^{242}, a^{243}, a^{244}, a^{245}, a^{246}, a^{247}, a^{248}, a^{249}, a^{250}, a^{251}, a^{252}, a^{253}, a^{254}, a^{255}, a^{256}, a^{257}, a^{258}, a^{259}, a^{260}, a^{261}, a^{262}, a^{263}, a^{264}, a^{265}, a^{266}, a^{267}, a^{268}, a^{269}, a^{270}, a^{271}, a^{272}, a^{273}, a^{274}, a^{275}, a^{276}, a^{277}, a^{278}, a^{279}, a^{280}, a^{281}, a^{282}, a^{283}, a^{284}, a^{285}, a^{286}, a^{287}, a^{288}, a^{289}, a^{290}, a^{291}, a^{292}, a^{293}, a^{294}, a^{295}, a^{296}, a^{297}, a^{298}, a^{299}, a^{300}, a^{301}, a^{302}, a^{303}, a^{304}, a^{305}, a^{306}, a^{307}, a^{308}, a^{309}, a^{310}, a^{311}, a^{312}, a^{313}, a^{314}, a^{315}, a^{316}, a^{317}, a^{318}, a^{319}, a^{320}, a^{321}, a^{322}, a^{323}, a^{324}, a^{325}, a^{326}, a^{327}, a^{328}, a^{329}, a^{330}, a^{331}, a^{332}, a^{333}, a^{334}, a^{335}, a^{336}, a^{337}, a^{338}, a^{339}, a^{340}, a^{341}, a^{342}, a^{343}, a^{344}, a^{345}, a^{346}, a^{347}, a^{348}, a^{349}, a^{350}, a^{351}, a^{352}, a^{353}, a^{354}, a^{355}, a^{356}, a^{357}, a^{358}, a^{359}, a^{360}, a^{361}, a^{362}, a^{363}, a^{364}, a^{365}, a^{366}, a^{367}, a^{368}, a^{369}, a^{370}, a^{371}, a^{372}, a^{373}, a^{374}, a^{375}, a^{376}, a^{377}, a^{378}, a^{379}, a^{380}, a^{381}, a^{382}, a^{383}, a^{384}, a^{385}, a^{386}, a^{387}, a^{388}, a^{389}, a^{390}, a^{391}, a^{392}, a^{393}, a^{394}, a^{395}, a^{396}, a^{397}, a^{398}, a^{399}, a^{400}, a^{401}, a^{402}, a^{403}, a^{404}, a^{405}, a^{406}, a^{407}, a^{408}, a^{409}, a^{410}, a^{411}, a^{412}, a^{413}, a^{414}, a^{415}, a^{416}, a^{417}, a^{418}, a^{419}, a^{420}, a^{421}, a^{422}, a^{423}, a^{424}, a^{425}, a^{426}, a^{427}, a^{428}, a^{429}, a^{430}, a^{431}, a^{432}, a^{433}, a^{434}, a^{435}, a^{436}, a^{437}, a^{438}, a^{439}, a^{440}, a^{441}, a^{442}, a^{443}, a^{444}, a^{445}, a^{446}, a^{447}, a^{448}, a^{449}, a^{450}, a^{451}, a^{452}, a^{453}, a^{454}, a^{455}, a^{456}, a^{457}, a^{458}, a^{459}, a^{460}, a^{461}, a^{462}, a^{463}, a^{464}, a^{465}, a^{466}, a^{467}, a^{468}, a^{469}, a^{470}, a^{471}, a^{472}, a^{473}, a^{474}, a^{475}, a^{476}, a^{477}, a^{478}, a^{479}, a^{480}, a^{481}, a^{482}, a^{483}, a^{484}, a^{485}, a^{486}, a^{487}, a^{488}, a^{489}, a^{490}, a^{491}, a^{492}, a^{493}, a^{494}, a^{495}, a^{496}, a^{497}, a^{498}, a^{499}, a^{500}, a^{501}, a^{502}, a^{503}, a^{504}, a^{505}, a^{506}, a^{507}, a^{508}, a^{509}, a^{510}, a^{511}, a^{512}, a^{513}, a^{514}, a^{515}, a^{516}, a^{517}, a^{518}, a^{519}, a^{520}, a^{521}, a^{522}, a^{523}, a^{524}, a^{525}, a^{526}, a^{527}, a^{528}, a^{529}, a^{530}, a^{531}, a^{532}, a^{533}, a^{534}, a^{535}, a^{536}, a^{537}, a^{538}, a^{539}, a^{540}, a^{541}, a^{542}, a^{543}, a^{544}, a^{545}, a^{546}, a^{547}, a^{548}, a^{549}, a^{550}, a^{551}, a^{552}, a^{553}, a^{554}, a^{555}, a^{556}, a^{557}, a^{558}, a^{559}, a^{560}, a^{561}, a^{562}, a^{563}, a^{564}, a^{565}, a^{566}, a^{567}, a^{568}, a^{569}, a^{570}, a^{571}, a^{572}, a^{573}, a^{574}, a^{575}, a^{576}, a^{577}, a^{578}, a^{579}, a^{580}, a^{581}, a^{582}, a^{583}, a^{584}, a^{585}, a^{586}, a^{587}, a^{588}, a^{589}, a^{590}, a^{591}, a^{592}, a^{593}, a^{594}, a^{595}, a^{596}, a^{597}, a^{598}, a^{599}, a^{600}, a^{601}, a^{602}, a^{603}, a^{604}, a^{605}, a^{606}, a^{607}, a^{608}, a^{609}, a^{610}, a^{611}, a^{612}, a^{613}, a^{614}, a^{615}, a^{616}, a^{617}, a^{618}, a^{619}, a^{620}, a^{621}, a^{622}, a^{623}, a^{624}, a^{625}, a^{626}, a^{627}, a^{628}, a^{629}, a^{630}, a^{631}, a^{632}, a^{633}, a^{634}, a^{635}, a^{636}, a^{637}, a^{638}, a^{639}, a^{640}, a^{641}, a^{642}, a^{643}, a^{644}, a^{645}, a^{646}, a^{647}, a^{648}, a^{649}, a^{650}, a^{651}, a^{652}, a^{653}, a^{654}, a^{655}, a^{656}, a^{657}, a^{658}, a^{659}, a^{660}, a^{661}, a^{662}, a^{663}, a^{664}, a^{665}, a^{666}, a^{667}, a^{668}, a^{669}, a^{670}, a^{671}, a^{672}, a^{673}, a^{674}, a^{675}, a^{676}, a^{677}, a^{678}, a^{679}, a^{680}, a^{681}, a^{682}, a^{683}, a^{684}, a^{685}, a^{686}, a^{687}, a^{688}, a^{689}, a^{690}, a^{691}, a^{692}, a^{693}, a^{694}, a^{695}, a^{696}, a^{697}, a^{698}, a^{699}, a^{700}, a^{701}, a^{702}, a^{703}, a^{704}, a^{705}, a^{706}, a^{707}, a^{708}, a^{709}, a^{710}, a^{711}, a^{712}, a^{713}, a^{714}, a^{715}, a^{716}, a^{717}, a^{718}, a^{719}, a^{720}, a^{721}, a^{722}, a^{723}, a^{724}, a^{725}, a^{726}, a^{727}, a^{728}, a^{729}, a^{730}, a^{731}, a^{732}, a^{733}, a^{734}, a^{735}, a^{736}, a^{737}, a^{738}, a^{739}, a^{740}, a^{741}, a^{742}, a^{743}, a^{744}, a^{745}, a^{746}, a^{747}, a^{748}, a^{749}, a^{750}, a^{751}, a^{752}, a^{753}, a^{754}, a^{755}, a^{756}, a^{757}, a^{758}, a^{759}, a^{760}, a^{761}, a^{762}, a^{763}, a^{764}, a^{765}, a^{766}, a^{767}, a^{768}, a^{769}, a^{770}, a^{771}, a^{772}, a^{773}, a^{774}, a^{775}, a^{776}, a^{777}, a^{778}, a^{779}, a^{780}, a^{781}, a^{782}, a^{783}, a^{784}, a^{785}, a^{786}, a^{787}, a^{788}, a^{789}, a^{790}, a^{791}, a^{792}, a^{793}, a^{794}, a^{795}, a^{796}, a^{797}, a^{798}, a^{799}, a^{800}, a^{801}, a^{802}, a^{803}, a^{804}, a^{805}, a^{806}, a^{807}, a^{808}, a^{809}, a^{810}, a^{811}, a^{812}, a^{813}, a^{814}, a^{815}, a^{816}, a^{817}, a^{818}, a^{819}, a^{820}, a^{821}, a^{822}, a^{823}, a^{824}, a^{825}, a^{826}, a^{827}, a^{828}, a^{829}, a^{830}, a^{831}, a^{832}, a^{833}, a^{834}, a^{835}, a^{836}, a^{837}, a^{838}, a^{839}, a^{840}, a^{841}, a^{842}, a^{843}, a^{844}, a^{845}, a^{846}, a^{847}, a^{848}, a^{849}, a^{850}, a^{851}, a^{852}, a^{853}, a^{854}, a^{855}, a^{856}, a^{857}, a^{858}, a^{859}, a^{860}, a^{861}, a^{862}, a^{863}, a^{864}, a^{865}, a^{866}, a^{867}, a^{868}, a^{869}, a^{870}, a^{871}, a^{872}, a^{873}, a^{874}, a^{875}, a^{876}, a^{877}, a^{878}, a^{879}, a^{880}, a^{881}, a^{882}, a^{883}, a^{884}, a^{885}, a^{886}, a^{887}, a^{888}, a^{889}, a^{890}, a^{891}, a^{892}, a^{893}, a^{894}, a^{895}, a^{896}, a^{897}, a^{898}, a^{899}, a^{900}, a^{901}, a^{902}, a^{903}, a^{904}, a^{905}, a^{906}, a^{907}, a^{908}, a^{909}, a^{910}, a^{911}, a^{912}, a^{913}, a^{914}, a^{915}, a^{916}, a^{917}, a^{918}, a^{919}, a^{920}, a^{921}, a^{922}, a^{923}, a^{924}, a^{925}, a^{926}, a^{927}, a^{928}, a^{929}, a^{930}, a^{931}, a^{932}, a^{933}, a^{934}, a^{935}, a^{936}, a^{937}, a^{938}, a^{939}, a^{940}, a^{941}, a^{942}, a^{943}, a^{944}, a^{945}, a^{946}, a^{947}, a^{948}, a^{949}, a^{950}, a^{951}, a^{952}, a^{953}, a^{954}, a^{955}, a^{956}, a^{957}, a^{958}, a^{959}, a^{960}, a^{961}, a^{962}, a^{963}, a^{964}, a^{965}, a^{966}, a^{967}, a^{968}, a^{969}, a^{970}, a^{971}, a^{972}, a^{973}, a^{974}, a^{975}, a^{976}, a^{977}, a^{978}, a^{979}, a^{980}, a^{981}, a^{982}, a^{983}, a^{984}, a^{985}, a^{986}, a^{987}, a^{988}, a^{989}, a^{990}, a^{991}, a^{992}, a^{993}, a^{994}, a^{995}, a^{996}, a^{997}, a^{998}, a^{999}, a^{1000}, a^{1001}, a^{1002}, a^{1003}, a^{1004}, a^{1005}, a^{1006}, a^{1007}, a^{1008}, a^{1009}, a^{1010}, a^{1011}, a^{1012}, a^{1013}, a^{1014}, a^{1015}, a^{1016}, a^{1017}, a^{1018}, a^{1019}, a^{1020}, a^{1021}, a^{1022}, a^{1023}, a^{1024}, a^{1025}, a^{1026}, a^{1027}, a^{1028}, a^{1029}, a^{1030}, a^{1031}, a^{1032}, a^{1033}, a^{1034}, a^{1035}, a^{1036}, a^{1037}, a^{1038}, a^{1039}, a^{1040}, a^{1041}, a^{1042}, a^{1043}, a^{1044}, a^{1045}, a^{1046}, a^{1047}, a^{1048}, a^{1049}, a^{1050}, a^{1051}, a^{1052}, a^{1053}, a^{1054}, a^{1055}, a^{1056}, a^{1057}, a^{1058}, a^{1059}, a^{1060}, a^{1061}, a^{1062}, a^{1063}, a^{1064}, a^{1065}, a^{1066}, a^{1067}, a^{1068}, a^{1069}, a^{1070}, a^{1071}, a^{1072}, a^{1073}, a^{1074}, a^{1075}, a^{1076}, a^{1077}, a^{1078}, a^{1079}, a^{1080}, a^{1081}, a^{1082}, a^{1083}, a^{1084}, a^{1085}, a^{1086}, a^{1087}, a^{1088}, a^{1089}, a^{1090}, a^{1091}, a^{1092}, a^{1093}, a^{1094}, a^{1095}, a^{1096}, a^{1097}, a^{1098}, a^{1099}, a^{1100}, a^{1101}, a^{1102}, a^{1103}, a^{1104}, a^{1105}, a^{1106}, a^{1107}, a^{1108}, a^{1109}, a^{1110}, a^{1111}, a^{1112}, a^{1113}, a^{1114}, a^{1115}, a^{1116}, a^{1117}, a^{1118}, a^{1119}, a^{1120}, a^{1121}, a^{1122}, a^{1123}, a^{1124}, a^{1125}, a^{1126}, a^{1127}, a^{1128}, a^{1129}, a^{1130}, a^{1131}, a^{1132}, a^{1133}, a^{1134}, a^{1135}, a^{1136}, a^{1137}, a^{1138}, a^{1139}, a^{1140}, a^{1141}, a^{1142}, a^{1143}, a^{1144}, a^{1145}, a^{1146}, a^{1147}, a^{1148}, a^{1149}, a^{1150}, a^{1151}, a^{1152}, a^{1153}, a^{1154}, a^{1155}, a^{1156}, a^{1157}, a^{1158}, a^{1159}, a^{1160}, a^{1161}, a^{1162}, a^{1163}, a^{1164}, a^{1165}, a^{1166}, a^{1167}, a^{1168}, a^{1169}, a^{1170}, a^{1171}, a^{1172}, a^{1173}, a^{1174}, a^{1175}, a^{1176}, a^{1177}, a^{1178}, a^{1179}, a^{1180}, a^{1181}, a^{1182}, a^{1183}, a^{1184}, a^{1185}, a^{1186}, a^{1187}, a^{1188}, a^{1189}, a^{1190}, a^{1191}, a^{1192}, a^{1193}, a^{1194}, a^{1195}, a^{1196}, a^{1197}, a^{1198}, a^{1199}, a^{1200}, a^{1201}, a^{1202}, a^{1203}, a^{1204}, a^{1205}, a^{1206}, a^{1207}, a^{1208}, a^{1209}, a^{1210}, a^{1211}, a^{1212}, a^{1213}, a^{1214}, a^{1215}, a^{1216}, a^{1217}, a^{1218}, a^{1219}, a^{1220}, a^{1221}, a^{1222}, a^{1223}, a^{1224}, a^{1225}, a^{1226}, a^{1227}, a^{1228}, a^{1229}, a^{1230}, a^{1231}, a^{1232}, a^{1233}, a^{1234}, a^{1235}, a^{1236}, a^{1237}, a^{1238}, a^{1239}, a^{1240}, a^{1241}, a^{1242}, a^{1243}, a^{1244}, a^{1245}, a^{1246}, a^{1247}, a^{1248}, a^{1249}, a^{1250}, a^{1251}, a^{1252}, a^{1253}, a^{1254}, a^{1255}, a^{1256}, a^{1257}, a^{1258}, a^{1259}, a^{1260}, a^{1261}, a^{1262}, a^{1263}, a^{1264}, a^{1265}, a^{1266}, a^{1267}, a^{1268}, a^{1269}, a^{1270}, a^{1271}, a^{1272}, a^{1273}, a^{1274}, a^{1275}, a^{1276}, a^{1277}, a^{1278}, a^{1279}, a^{1280}, a^{1281}, a^{1282}, a^{1283}, a^{1284}, a^{1285}, a^{1286}, a^{1287}, a^{1288}, a^{1289}, a^{1290}, a^{1291}, a^{1292}, a^{1293}, a^{1294}, a^{1295}, a^{1296}, a^{1297}, a^{1298}, a^{1299}, a^{1300}, a^{1301}, a^{1302}, a^{1303}, a^{1304}, a^{1305}, a^{1306}, a^{1307}, a^{1308}, a^{1309}, a^{1310}, a^{1311}, a^{1312}, a^{1313}, a^{1314}, a^{1315}, a^{1316}, a^{1317}, a^{1318}, a^{1319}, a^{1320}, a^{1321}, a^{1322}, a^{1323}, a^{1324}, a^{1325}, a^{1326}, a^{1327}, a^{1328}, a^{1329}, a^{1330}, a^{1331}, a^{1332}, a^{1333}, a^{1334}, a^{1335}, a^{1336}, a^{1337}, a^{1338}, a^{1339}, a^{1340}, a^{1341}, a^{1342}, a^{1343}, a^{1344}, a^{1345}, a^{1346}, a^{1347}, a^{1348}, a^{1349}, a^{1350}, a^{1351}, a^{1352}, a^{1353}, a^{1354}, a^{1355}, a^{1356}, a^{1357}, a^{1358}, a^{1359}, a^{1360}, a^{1361}, a^{1362}, a^{1363}, a^{1364}, a^{1365}, a^{1366}, a^{1367}, a^{1368}, a^{1369}, a^{1370}, a^{1371}, a^{1372}, a^{1373}, a^{1374}, a^{1375}, a^{1376}, a^{1377}, a^{1378}, a^{1379}, a^{1380}, a^{1381}, a^{1382}, a^{1383}, a^{1384}, a^{1385}, a^{1386}, a^{1387}, a^{1388}, a^{1389}, a^{1390}, a^{1391}, a^{1392}, a^{1393}, a^{1394}, a^{1395}, a^{1396}, a^{1397}, a^{1398}, a^{1399}, a^{1400}, a^{1401}, a^{1402}, a^{1403}, a^{1404}, a^{1405}, a^{1406}, a^{1407}, a^{1408}, a^{1409}, a^{1410}, a^{1411}, a^{1412}, a^{1413}, a^{1414}, a^{1415}, a^{1416}, a^{1417}, a^{1418}, a^{1419}, a^{1420}, a^{1421}, a^{1422}, a^{1423}, a^{1424}, a^{1425}, a^{1426}, a^{1427}, a^{1428}, a^{1429}, a^{1430}, a^{1431}, a^{1432}, a^{1433}, a^{1434}, a^{1435}, a^{1436}, a^{1437}, a^{1438}, a^{1439}, a^{1440}, a^{1441}, a^{1442}, a^{1443}, a^{1444}, a^{1445}, a^{1446}, a^{1447}, a^{1448}, a^{1449}, a^{1450}, a^{1451}, a^{1452}, a^{1453}, a^{1454}, a^{1455}, a^{1456}, a^{1457}, a^{1458}, a^{1459}, a^{1460}, a^{1461}, a^{1462}, a^{1463}, a^{1464}, a^{1465}, a^{1466}, a^{1467}, a^{1468}, a^{1469}, a^{1470}, a^{1471}, a^{1472}, a^{1473}, a^{1474}, a^{1475}, a^{1476}, a^{1477}, a^{1478}, a^{1479}, a^{1480}, a^{1481}, a^{1482}, a^{1483}, a^{1484}, a^{1485}, a^{1486}, a^{1487}, a^{1488}, a^{1489}, a^{1490}, a^{1491}, a^{1492}, a^{1493}, a^{1494}, a^{1495}, a^{1496}, a^{1497}, a^{1498}, a^{1499}, a^{1500}, a^{1501}, a^{1502}, a^{1503}, a^{1504}, a^{1505}, a^{1506}, a^{1507}, a^{1508}, a^{1509}, a^{1510}, a^{1511}, a^{1512}, a^{1513}, a^{1514}, a^{1515}, a^{1516}, a^{1517}, a^{1518}, a^{1519}, a^{1520}, a^{1521}, a^{1522}, a^{1523}, a^{1524}, a^{1525}, a^{1526}, a^{1527}, a^{1528}, a^{1529}, a^{1530}, a^{1531}, a^{1532}, a^{1533}, a^{1534}, a^{1535}, a^{1536}, a^{1537}, a^{1$$

$$L_1 = \{a^n b^n \mid n \geq 0\}$$

$$a^i b^j c^k \mid i+k=j$$

$$GLC: S \rightarrow OS \mid \lambda$$

$$S \rightarrow XY$$

$$X \rightarrow aXb \mid \lambda$$

$$Y \rightarrow bYc \mid \lambda$$

$$GLC \ G = (\{A, B\}, \{a, b\}, R, A)$$

a) Construa uma GLC  $G'$

2a)

$$A_0 \rightarrow A$$

$$A \rightarrow aAbb \mid B$$

$$B \rightarrow bBaa \mid A \mid \lambda$$

Eliminar  $B \rightarrow \lambda$

Eliminar  $A \rightarrow \lambda$

Eliminar  $B \rightarrow A$

Eliminar  $B \rightarrow B$

Eliminar  $A \rightarrow B$

Eliminar  $A_0 \rightarrow A$

$$A_0 \rightarrow A$$

$$A_0 \rightarrow A \mid \lambda$$

$$A_0 \rightarrow A \mid \lambda$$

$$A_0 \rightarrow A \mid \lambda$$

$$A_0 \rightarrow A \mid \lambda$$

$$A_0 \rightarrow \lambda \mid aAbb \mid abb \mid bBaa \mid baa$$

$$A \rightarrow aAbb \mid B \mid \lambda$$

$$A \rightarrow aAbb \mid B \mid abb$$

$$A \rightarrow aAbb \mid B \mid abb$$

$$A \rightarrow aAbb \mid B \mid abb$$

$$A \rightarrow aAbb \mid abb \mid bBaa \mid baa$$

$$A \rightarrow aAbb \mid abb \mid bBaa \mid baa$$

$$B \rightarrow bBaa \mid A \mid baa$$

$$B \rightarrow bBaa \mid A \mid baa$$

$$B \rightarrow bBaa \mid baa \mid aAbb \mid B \mid abb$$

$$B \rightarrow bBaa \mid baa \mid aAbb \mid abb$$

$$B \rightarrow bBaa \mid baa \mid aAbb \mid abb$$

$$B \rightarrow bBaa \mid baa \mid aAbb \mid abb$$

Conversão das regras remanescentes (I)

Conversão das regras remanescentes (II)

$$A_0 \rightarrow \lambda \mid XAYY \mid XYY \mid YBXX \mid YXX$$

$$A_0 \rightarrow \lambda \mid XP \mid XQ \mid YR \mid YS$$

$$A \rightarrow XAYY \mid XYY \mid YBXX \mid YXX$$

$$A \rightarrow XP \mid XQ \mid YR \mid YS$$

$$B \rightarrow YBXX \mid YXX \mid XAYY \mid XYY$$

$$B \rightarrow YR \mid YS \mid XP \mid XQ$$

$$X \rightarrow a$$

$$X \rightarrow a$$

$$Y \rightarrow b$$

$$Y \rightarrow b$$

$$P \rightarrow AQ$$

$$R \rightarrow BS$$

$$Q \rightarrow YY$$

$$S \rightarrow XX$$

GLC para  $\overline{a^n b^n}$   $S. (a \cup b)^* b a (a \cup b)^*$   
 $T. n_b > n_a$   
 $V. n_a > n_b$

$$X \rightarrow S I T I V$$

$$S \rightarrow aS | bS | S a | S b | b a$$

$$T \rightarrow a T b | b U \quad V \rightarrow a V b | a W$$

$$U \rightarrow b U | \lambda \quad W \rightarrow a W | \lambda$$

GLC para  $\overline{a^n b^n c^n}$   $\cdot \Sigma^* b a \Sigma^*, \Sigma^* c a \Sigma^*, \Sigma^* c b \Sigma^*$   
 $\cdot n_b \neq n_b$   
 $\cdot n_b \neq n_c$   
 $\cdot n_a \neq n_c$

$$S \rightarrow A | B | C$$

$$\textcircled{1} A \rightarrow a A | b A | c A | A a | A b | A c | b a$$

$$\textcircled{4} D \rightarrow D c | E | G$$

$$\textcircled{5} I \rightarrow a I | J | L$$

$$\textcircled{6} N \rightarrow a N c | P c | a R$$

$$\textcircled{2} B \rightarrow a B | b B | c B | B a | B b | B c | c a$$

$$E \rightarrow a E b | b F$$

$$G \rightarrow a G b | a H$$

$$J \rightarrow b J c | b K$$

$$L \rightarrow b J c | c M$$

$$P \rightarrow P c | Q$$

$$R \rightarrow a R | Q$$

$$\textcircled{3} C \rightarrow a c | b c | c C | c a | c b | c c | c b$$

$$F \rightarrow b F | \lambda$$

$$H \rightarrow a H | \lambda$$

$$K \rightarrow b K | \lambda$$

$$M \rightarrow c M | \lambda$$

$$Q \rightarrow b Q | \lambda$$

GLC para  $a^n b^n c^m d^m : n, m \geq 0$

$$S \rightarrow A B$$

$$A \rightarrow a A b | \lambda$$

$$B \rightarrow c B d | \lambda$$

GLC para  $a^n b^m c^p : n \geq m \text{ or } m = p$

$$S \rightarrow A C | D E$$

$$A \rightarrow a A b | B$$

$$D \rightarrow a D | \lambda$$

$$B \rightarrow a B | \lambda$$

$$E \rightarrow b E c | \lambda$$

$$C \rightarrow C c | \lambda$$

GLC para  $a^i b^j c^k : i = j \text{ or } j = k$

$$S \rightarrow A B | C D$$

$$A \rightarrow a A b | \lambda$$

$$B \rightarrow B c | \lambda$$