Prova P1 – Sistemas de Programação – PCS 3216

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1ª Questão

a) Qual é a funcionalidade deste programa?

O código lê os caracteres do vetor iniciado em INIC e escreve esses caracteres na fita de saída.

b) Compatibilize-o com o seu montador e obtenha para ele um código objeto carregável.

O código objeto obtido foi

```
01 00 2d 8e 00 92 01 82 02 91 0c 82 03 91 0d 8e
01 e0 04 82 01 52 00 92 01 11 2a 81 0d 42 00 91
0d 11 22 01 0c 81 0c 42 00 91 0c 01 0c c1 00 6f
00 03 02 00 fb 00 04 02 00 fa 02 00 05 01 00 8e
01 69 0e 00 07 05 74 65 78 74 6f b2
```

O código compatibilizado é

```
       @     100

START  LD    COMP
       MM    CONT

IN     LD    LDA0
       MM    LDA
       LD    LDA0+1
       MM    LDA+1

;LDA    LD    INIC
;LDA+1  PD    SAIDA
LDA    K     8e
LDA+1  K     01
       PD    SAIDA

       LD    CONT
       -     UM
       MM    CONT
       JZ    FORA

       LD    LDA+1
       +     UM
       MM    LDA+1

       JZ    INCR
       JP    LDA

INCR   LD    LDA
       +     UM
```

```
      MM   LDA
      JP   LDA

FORA  HM   START

      @    200

UM    K    1
CONT  K    0
;LDA0  LD  INIC
;LDA0+1 K 0
LDA0   K  8e
LDA0+1 K  01

      @    E00
COMP  K    5
INIC  K    74       ;"t"
      K    65       ;"e"
      K    78       ;"x"
      K    74       ;"t"
      K    6F       ;"o"
      #
```

Foram alteradas:

- as linhas com @ pois endereço na máquina não precisa de \ antes
- a instrução LDA para LD
- as linhas que definem LDA e LDA0, pois a implementação do montador não permite o operando com +1
- o endereço da área do vetor de texto, pois a área depois de F00 já era reservada para o loader

c) Teste-o e faça funcionar se encontrar algum erro de lógica

A saída foi

```
74
65
78
74
6f

Máquina parada
```

d) Em lugar de operar sobre a cadeia "texto", modifique esse programa de modo que passe a operar sobre os dados que você preparou previamente a partir do texto do seu nome (item 2 de preparação para a prova).

Foram alteradas as linhas finais para

```
      @    E00      ; o endereço aqui foi modificado pois F00 é a
localização do loader
COMP  K    10       ; comprimento do texto, em hexa
INIC  K    42       ;"B"      primeira letra do texto
      K    45       ;"E"
```

```
K   52      ;"R"
K   4E      ;"N"
K   41      ;"A"      ultima letra do texto
K   52      ;"R"
K   44      ;"D"
K   4F      ;"O"
K   4D      ;"M"
K   41      ;"A"
K   52      ;"R"
K   43      ;"C"
K   45      ;"E"
K   4C      ;"L"
K   49      ;"I"
K   4E      ;"N"      ultima letra do texto
```

e) Teste-o no simulador e comprove seu funcionamento.

Código Objeto

```
01 00 2d 8e 00 92 01 82 02 91 0c 82 03 91 0d 8e
01 e0 04 82 01 52 00 92 01 11 2a 81 0d 42 00 91
0d 11 22 01 0c 81 0c 42 00 91 0c 01 0c c1 00 6f
00 03 02 00 fb 00 04 02 00 fa 02 00 05 01 00 8e
01 69 0e 00 12 10 42 45 52 4e 41 52 44 4f 4d 41
52 43 45 4c 49 4e 38
```

Saída do programa

```
42
45
52
4e
41
52
44
4f
4d
41
52
43
45
4c
49
4e

Máquina parada
```

f) Relate e entregue o relatório em arquivo pdf.

2ª Questão

O código foi elaborado com base no da questão anterior, com as principais alterações marcadas em negrito. Cada algarismo do número USP é lido do vetor por meio de LDA e é somado a uma variável TOTAL, então faz-se a multiplicação por 16 seguida da divisão por 16, obtendo-se assim o resto da divisão por 16. Esse valor é então escrito na fita de saída e pega-se o próximo algarismo do número USP, repetindo assim o algoritmo até a variável CONT chegar a 0, encerrando o loop.

A saída do programa condiz com o resultado esperado:

```
7
0
1
7
a
2
b
b

Máquina parada
```

O programa feito foi

```
      @    497

START LD   COMP
      MM   CONT

IN    LD   LDA0
      MM   LDA
      LD   LDA0+1
      MM   LDA+1

LDA   K    8e
LDA+1 K    01
      +    TOTAL ; atualiza TOTAL
      MM   TOTAL
      *    DEZESSEIS  ; multiplica por 0x10 para eliminar o mais significativo
                      ; e divide em seguida por 0x10 para ficar so o menos
                      ; significativo, que eh o resto da divisao por 16
      /    DEZESSEIS
      PD   0

; testa se e a ultima letra
      LD   CONT
      -    UM     ; decrementa contador do loop
      MM   CONT
      JZ   FORA   ; se zerar, terminou o loop, se nao, prossegue

; incrementa o endereco a ser acessado no vetor de letras
      LD   LDA+1
      +    UM     ; incrementa byte menos significativo
      MM   LDA+1

      JZ   INCR   ; se deu zero, vai incrementar o outro byte
      JP   LDA    ; se nao, executa mais uma instancia do loop

; incrementa o byte mais significativo do endereco a acessar
INCR  LD   LDA
      +    UM     ; incrementa byte mais significativo
      MM   LDA
      JP   LDA    ; e vai executar outra instancia do loop

; final do loop
```

```
FORA  HM   START  ; para a maquina e volta ao inicio se for reacionada

; ==========================  aREA DE DADOS   ============================
;
          @ 200
; constantes e variaveis
UM        K   1       ; constante 1
CONT      K   0       ; variavel CONT iniciada com zero
LDA0      K  8e
LDA0+1    K  01
TOTAL     K   0
DEZESSEIS K  10

     @ E00
COMP K   8
; nusp 09836197
NUSP K  37
     K  39
     K  31
     K  36
     K  33
     K  38
     K  39
     K  30

     #
```

Código objeto:

```
04 97 34 8e 00 92 01 82 02 94 a3 82 03 94 a4 8e
01 42 04 92 04 62 05 72 05 e0 00 82 01 52 00 92
01 14 c9 84 a4 42 00 94 a4 14 c1 04 a3 84 a3 42
00 94 a3 04 a3 c4 97 02 00 06 01 00 8e 01 00 10
0e 00 11 08 37 39 31 36 33 38 39 30 00 00 00 00
00 00 00 00
```

Memória antes de carregar

```
DEBUG MEM[000]: 0f 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[010]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[020]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[030]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[040]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[050]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[060]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[070]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[080]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[090]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[0a0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[0b0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[0c0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[0d0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[0e0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[0f0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[100]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[110]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[120]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[130]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[140]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[150]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[160]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[170]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[180]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[190]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[1a0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[1b0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[1c0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[1d0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[1e0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[1f0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[200]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[210]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[220]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[230]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[240]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[250]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[260]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[270]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[280]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[290]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[2a0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[2b0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[2c0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[2d0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[2e0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[2f0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[300]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[310]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[330]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[340]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[350]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[360]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[370]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[380]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[390]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[3a0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[3b0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[3c0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[3d0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[3e0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[3f0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[450]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[480]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[4a0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[4b0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[4c0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[4d0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[4e0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[4f0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[500]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[510]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[520]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[530]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[570]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[5c0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[5d0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[6c0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[760]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[770]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[780]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[7b0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[7c0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[7d0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[7e0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[7f0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[800]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[810]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[820]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[830]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[840]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[850]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[860]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[880]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[890]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[8a0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[8b0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[8c0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[8d0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[900]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[970]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[980]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[990]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[9a0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[9b0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[9c0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[9d0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[9e0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

```
DEBUG MEM[9f0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[a00]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[a10]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[a20]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[a30]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[a40]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[a50]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[a60]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[a70]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[a80]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[a90]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[aa0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ab0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ac0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ad0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ae0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[af0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[b00]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[b10]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[b20]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[b30]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[b40]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[b50]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[b60]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[b70]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[b80]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[b90]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ba0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[bb0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[bc0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[bd0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[be0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[bf0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[c00]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[c10]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[c20]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[c30]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[c40]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[c50]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[c60]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[c70]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[c80]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[c90]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ca0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[cb0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[cc0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[cd0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ce0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[cf0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[d00]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[d10]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[d20]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[d30]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[d40]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[d50]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[d60]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[d70]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[d80]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[d90]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[da0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[db0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[dc0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[dd0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[de0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[df0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[e00]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[e10]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[e20]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[e30]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[e40]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[e50]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[e60]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[e70]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[e80]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[e90]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ea0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[eb0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ec0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ed0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ee0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

```
DEBUG MEM[ef0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[f00]: d0 00 9f 44 4f 4b 9f 46 d0 00 9f 45 9f 47 d0 00
DEBUG MEM[f10]: 9f 4a d0 00 0f 46 8f 47 4f 4c 1f 3a 9f 47 8f 4a
DEBUG MEM[f20]: 5f 4c 9f 4a 1f 28 0f 12 d0 00 4f 4b 1f 42 9f 46
DEBUG MEM[f30]: d0 00 9f 47 d0 00 9f 4a 0f 12 8f 46 4f 4c 9f 46
DEBUG MEM[f40]: 0f 1c 30 00 00 00 00 00 0f 16 00 90 01 00 00 00
DEBUG MEM[f50]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[f60]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[f70]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[f80]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[f90]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[fa0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[fb0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[fc0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[fd0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[fe0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ff0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Memória depois de carregar o programa

```
DEBUG MEM[000]: 0f 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[010]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[020]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[030]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[040]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[050]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[060]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[070]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[080]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[090]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[0a0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[0b0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[0c0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[0d0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[0e0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[100]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[130]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[140]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[150]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[160]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[170]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[190]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[1a0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[1b0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[4a0]: 03 94 a4 8e 01 42 04 92 04 62 05 72 05 e0 00 82
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```

```
DEBUG MEM[ef0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[f00]: d0 00 9f 44 4f 4b 9f 46 d0 00 9f 45 9f 47 d0 00
DEBUG MEM[f10]: 9f 4a d0 00 0f 46 8f 47 4f 4c 1f 3a 9f 47 8f 4a
DEBUG MEM[f20]: 5f 4c 9f 4a 1f 28 0f 12 d0 00 4f 4b 1f 42 9f 46
DEBUG MEM[f30]: d0 00 9f 47 d0 00 9f 4a 0f 12 8f 46 4f 4c 9f 46
DEBUG MEM[f40]: 0f 1c 30 00 04 97 9e 11 0f 16 00 90 01 00 00 00
DEBUG MEM[f50]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[fe0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[ff0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Após o término

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DEBUG MEM[000]: 0f 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[010]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[020]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[030]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[4a0]: 03 94 a4 8e 08 42 04 92 04 62 05 72 05 e0 00 82
DEBUG MEM[4b0]: 01 52 00 92 01 14 c9 84 a4 42 00 94 a4 14 c1 04
DEBUG MEM[4c0]: a3 84 a3 42 00 94 a3 04 a3 c4 97 00 00 00 00 00
DEBUG MEM[4d0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[4e0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[5c0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
DEBUG MEM[5d0]: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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DEBUG MEM[f20]: 5f 4c 9f 4a 1f 28 0f 12 d0 00 4f 4b 1f 42 9f 46
DEBUG MEM[f30]: d0 00 9f 47 d0 00 9f 4a 0f 12 8f 46 4f 4c 9f 46
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