

PS_Q4.R

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Wed Jul 18 19:41:24 2018

```
# Problema da Prova Substitutiva - Questão 4 - 1º sem. 2018
#
# CEP e Capacidade de Processo
#
# Dados do Problema:
#
# Modelo: Distribuicao Normal
#

# Cotia, 18.07.2018
# Walter Ponge-Ferreira

setwd("~/Documents/Data/Pasta Tecnica/R/PME3463 Provas 2018")
rm(list=ls())

# Dados do problema
sigma <- 0.240

# a) Limites de Especificação
(LSL <- 20.0)
```

```
## [1] 20
```

```
(USL <- 21.0)
```

```
## [1] 21
```

```
n <- 4
k <- 6

x <- c(20.150, 21.094, 20.135, 20.247,
      20.272, 20.214, 20.191, 20.288,
      20.246, 20.272, 20.272, 20.063,
      20.213, 20.237, 20.194, 20.198,
      20.261, 21.194, 19.964, 20.128,
      20.233, 20.066, 20.249, 20.241)

xm <- mean(x)
sx <- sd(x)
R <- diff(range(x))

x <- matrix(x, ncol = k)

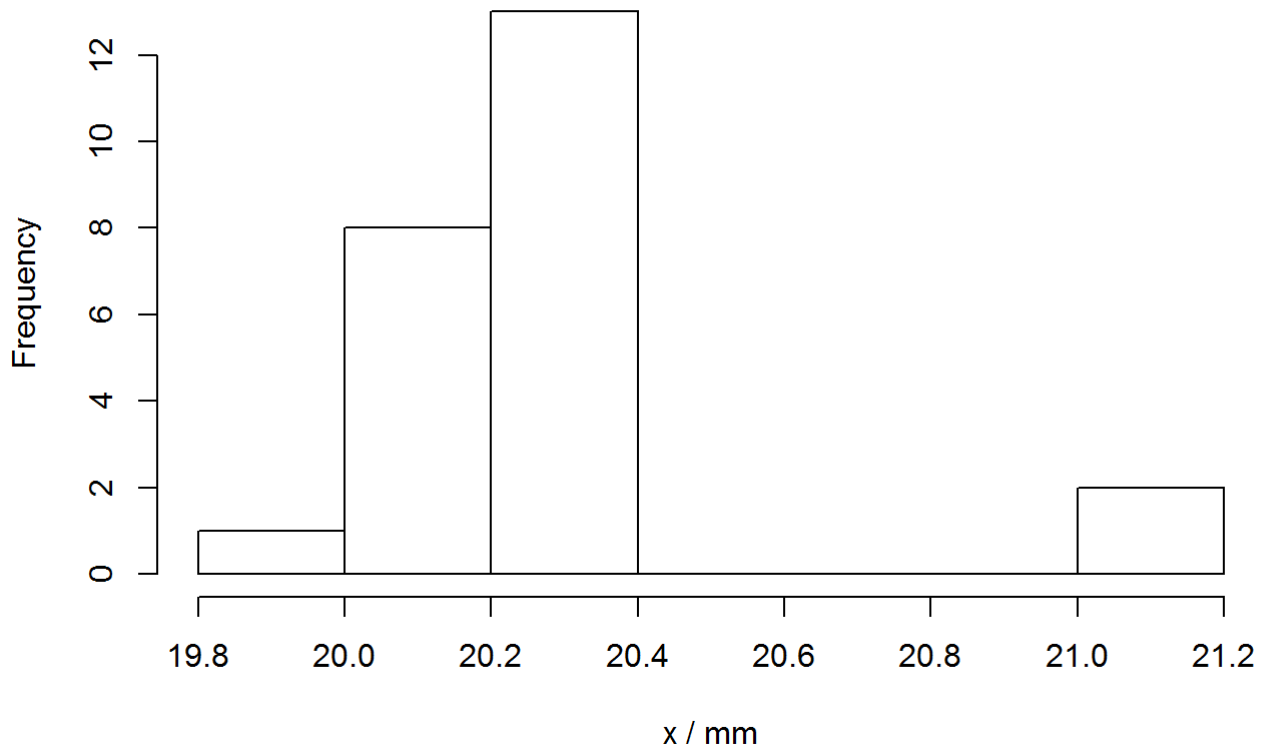
xmm <- mean(apply(x,2,mean))
sm <- mean(apply(x,2,sd))

# (b) Histograma

b <- seq(19.8,21.2,0.2)

hist(x, breaks = b, xlab = "x / mm")
```

Histogram of x



```
# (c) Process Yield
```

```
Nnc <- length(x[x<LSL | x>USL])
```

```
N <- length(x)
```

```
(yield <- (1-Nnc/N))
```

```
## [1] 0.875
```

```
# (d) Índices de Desempenho do Processo com sigma conhecido
```

```
(Pk <- (USL - LSL)/(6*sigma))
```

```
## [1] 0.6944444
```

```
(PpkU <- (USL - xm)/(3*sigma))
```

```
## [1] 1.005671
```

```
(PpkL <- (xm - LSL)/(3*sigma))
```

```
## [1] 0.3832176
```

```
(Ppk <- min(c(PpkU,PpkL)))
```

```
## [1] 0.3832176
```

```
# (d)' Índices de Desempenho do Processo com estimativa de sigma
```

```
Pk2 <- (USL - LSL)/(6*sx)
```

```
PpkU2 <- (USL - xm)/(3*sx)
```

```
PpkL2 <- (xm - LSL)/(3*sx)
```

```
Ppk2 <- min(c(PpkU2,PpkL2))
```

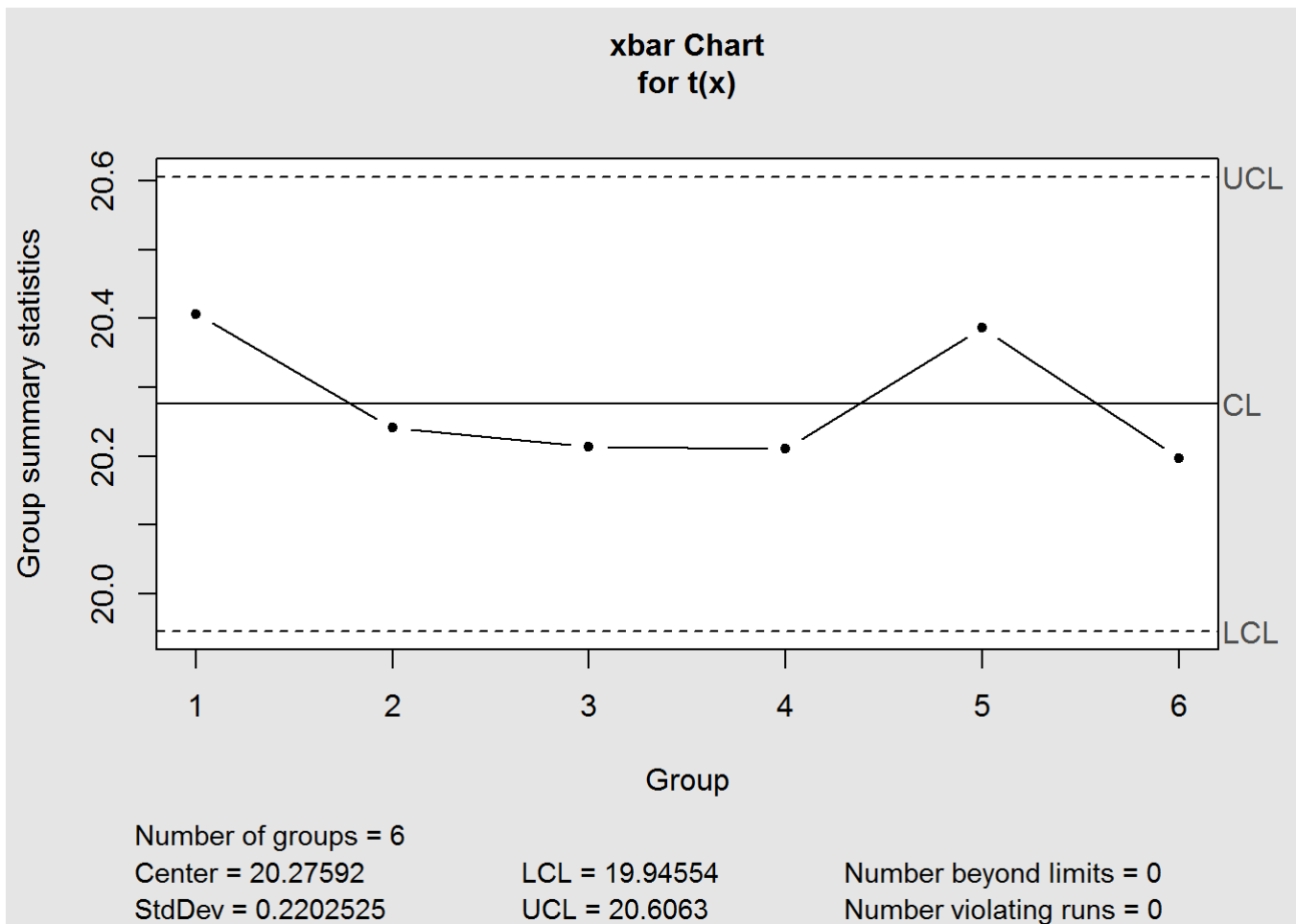
```
# (e) Carta de Controle
```

```
library(qcc)
```

```
## Package 'qcc' version 2.7
```

```
## Type 'citation("qcc")' for citing this R package in publications.
```

```
carta.xbar <- qcc(t(x), type = "xbar")
```



```
(CLx <- xmm)
```

```
## [1] 20.27592
```

```
(UCLx <- xmm + 3 * sigma / sqrt(n))
```

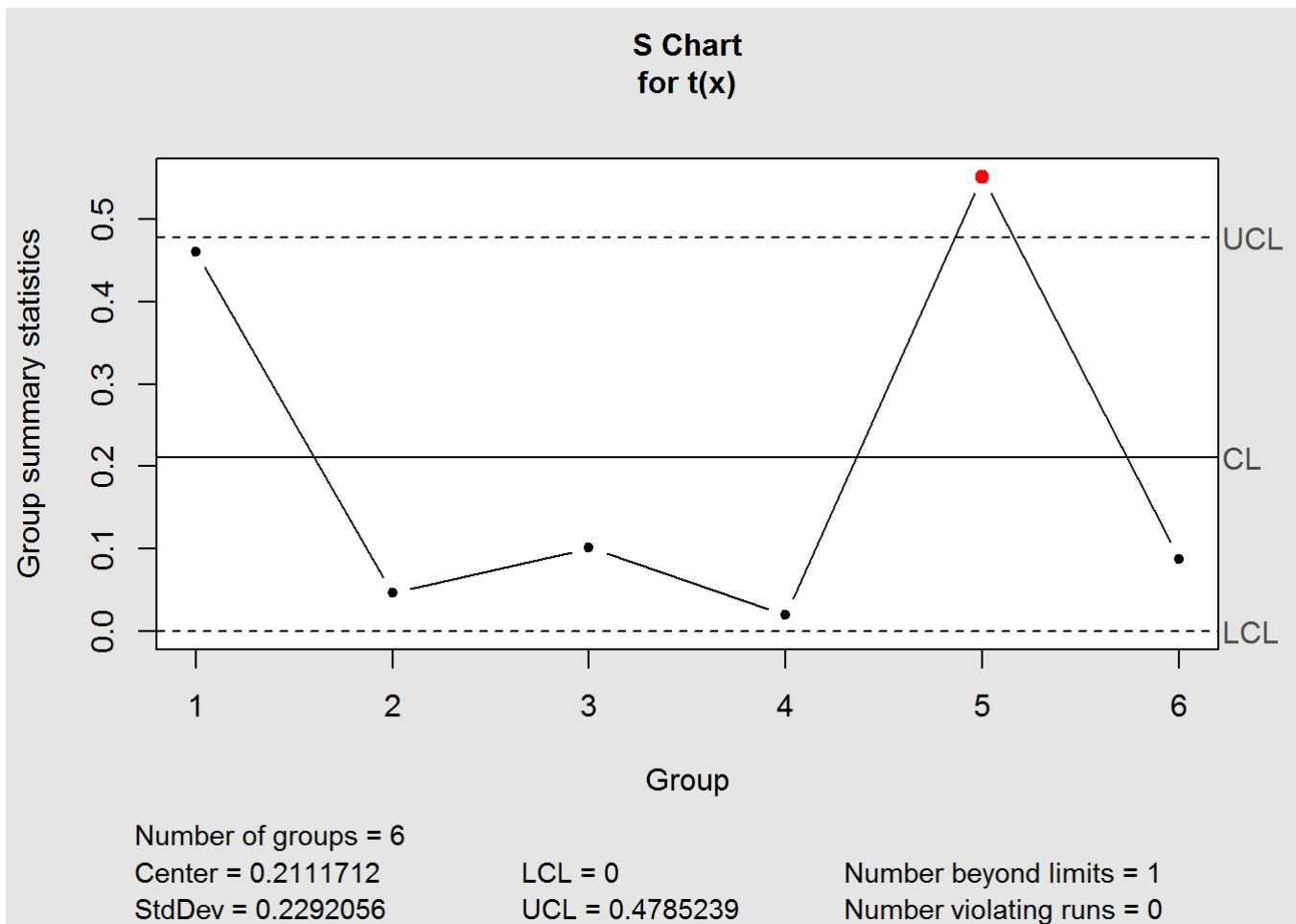
```
## [1] 20.63592
```

```
(LCLx <- xmm - 3 * sigma / sqrt(n))
```

```
## [1] 19.91592
```

```
carta.sigma <- qcc(t(x), type = "S")
```

```
library(SixSigma)
```



```
(C4 <- ss.cc.getc4(n))
```

```
##      c4
## 0.9213177
```

```
(CLs <- sm)
```

```
## [1] 0.2111712
```

```
(UCLs <- sm + 3 * sm * sqrt(1-C4^2)/C4)
```

```
##      c4
## 0.4785239
```

```
(LCLs <- max(c(sm - 3 * sm * sqrt(1-C4^2)/C4),0))
```

```
## [1] 0
```

```
# (f) Índices de Capacidade de Processo
```

```
(Ck <- (USL - LSL)/(6*sm))
```

```
## [1] 0.789249
```

```
(CpkU <- (USL - xm)/(3*sm))
```

```
## [1] 1.142964
```

```
(CpkL <- (xm - LSL)/(3*sm))
```

```
## [1] 0.4355339
```

```
(Cpk <- min(c(CpkU,CpkL)))
```

```
## [1] 0.4355339
```

```
# (g) O processo é estável? -> CCE
```

```
carta.xbar$violations
```

```
## $beyond.limits  
## integer(0)  
##  
## $violating.runs  
## numeric(0)
```

```
carta.sigma$violations
```

```
## $beyond.limits  
## [1] 5  
##  
## $violating.runs  
## numeric(0)
```

```
# (h) O processo é capaz? -> Índices de Desempenho e Capacidade
```

```
Pk >= 1.0
```

```
## [1] FALSE
```

```
Ppk >= 1.0
```

```
## [1] FALSE
```

```
Ck >= 1.0
```

```
## [1] FALSE
```

```
Ppk >= 1.0
```

[1] FALSE

Fim do Arquivo