NAME

Fend1() − Virtual waiting time distribution function

SYNOPSIS in a C-program

#include <queuel.h>

double Fend1(double x, int n, double rho);

SYNOPSIS in Mathematica

Fend1[Real, Integer, Real]

SYNOPSIS with MathLink

LnkFend1[Real, Integer, Real]

DESCRIPTION

delim $$ **Fend1()** is a model for the ${E sub n}/D/1$ queuing system with Erlang-n arrivals and deterministic (constant) service time. Parameter *x* is the amount of unfinished work in the system and *Rho* is the load level of the system.

ALGORITHM

${E sub n}/D/1$ waiting time distribution is calculated using the following algorithm:

P{$W <= x$}$ = n{F sub n}(x) = n{e sup {{lambda}x}}{P sub mn+n-1}(x-m).$

To calculate this probability, we need to resolve the coefficients of polynomials ${P sub k}$ up to $k = nm+n-1$, where m is the integral part of x.

${P sub mn} = ({sum} from {j=0} to {mn-n} {a sub j sup (mn-n)}, {-{beta} over 1}{a sub 0 sup (mn-1)}, {-{beta} over 2}{a sub 1 sup (mn-1)},...,{-{beta} over mn}{a sub mn-1 sup (mn-1)}),$
${P sub mn+i} = ({sum} from {j=0} to {mn+i-n} {a sub j sup (mn+i-n)}, {-{lambda} over 1}{a sub 0 sup (mn+i-1)}, {-{lambda} over 2}{a sub 1 sup (mn+i-1)},...,{-{lambda} over mn+1}{a sub mn+i-1 sup (mn+i-1)}),$
where $i=1,...,n-1$ and $m=1, 2,...$

The recursion starts from the initial values ${a sub 0 sup (i-1)} = {P sub i sup o}:$
${P sub 0} = ({P sub 1 sup o}),$
${P sub i} = ({P sub i+1 sup o}, {-{lambda} over 1}{a sub 0 sup (i-1)}, {-{lambda} over 2}{a sub 1 sup (i-1)},...,{-{lambda} over 3}{a sub i-1 sup (i-1)})$, $i=1,...,n-1.$

What remains is to determine the initial values ${P sub i sup o}.$

ERRORS

When $ rho $ is close to 1, these functions might give inaccurate results.

SEE ALSO

S. Aalto & J. Virtamo: M/D/n queue revisited.