

# INVERSE HEAT CONDUCTION Ill-posed Problems

2<sup>nd</sup> Edition, WILEY, 2023

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Heat conduction Matlab function for the X22B(y-t)0Y22B00T0 case using a piecewise-uniform and constant approximation (puca):

**fdX22By\_t\_0Y22B00T0\_puca.m**

## Syntax

```
fdX22By_t_0Y22B00T0_puca(xd, yd, Wd, td, py, pt, A, M, N)
```

## Description

fdX22By\_t\_0Y22B00T0\_puca (*xd*, *yd*, *Wd*, *td*, *py*, *pt*, *A*, *M*, *N*) returns the dimensionless temperature *Td* at a given dimensionless location (*xd*, *yd*) with *xd* between 0 and 1, and *yd* between 0 and *Wd*, and at a given dimensionless time *td*, when a space and time variation of the surface heat flux having *py* and *pt* as space and time exponents (positive or negative), respectively, is applied. Also, it calls the fdX22By1pt10Y22B00T0 (*xd*, *yd*, *Wd*, *td*, *W0d*, *A*) building block function that is computed with an accuracy of  $10^{-A}$  ( $A = 2, 3, \dots, 15$ ); while *M* indicates the number of time steps chosen up to the dimensionless time *td* of evaluation and *N* indicates the number of space steps chosen up to the dimensionless width *Wd* of the rectangle.

If *xd*, *yd* and *td* are not single values but arrays ( $\text{length}(xd) = m$ ,  $\text{length}(yd) = n$  and  $\text{length}(td) = p$ ) defining the dimensionless coordinates and times of interest, the above function returns the dimensionless temperature *Td* as a 3D subscripted array, where  $\text{size}(Td) = [m, n, p]$ .

## Examples

### Example 1

```
>> [Td]=fdX22By_t_0Y22B00T0_puca(0,2,4,0.08,1,1,10,2,4)
```

```
Td =
```

```
0.030820223067920
```

### Example 2

```
>> [Td]=fdX22By_t_0Y22B00T0_puca(0,2,4,0.08,-1,-1,10,2,4)
Td =
    4.511398047905004
```

### Example 3

```
>> xd=[0 1]'
xd =
     0
     1
>> yd=[0 .5 1.5]'
yd =
           0
    0.5000000000000000
    1.5000000000000000
>> td=[0.01 .1 1]'
td =
    0.0100000000000000
    0.1000000000000000
    1.0000000000000000
>> [Td]=fdX22By_t_0Y22B00T0_puca(xd,yd,2,td,-1,1,15,100,100)
Td(:, :, 1) =
    0.040978813645702    0.001531988681080    0.000502259088070
    0.000000000000000    0.000000000000000   -0.000000000000000
Td(:, :, 2) =
    0.706055089603470    0.071443171367256    0.016218632750006
    0.001604706240377    0.000798592088808    0.000110221088254
Td(:, :, 3) =
    11.142646163673190    3.472400174993302    1.055377073843029
    1.944689629863829    1.629620263144961    0.683991224956563
```