cracked section properties

Beam section input parameters:

```
excel_IN( "no" , "BMCR.xlsx" , "BMCR" , "B7" , eval( [1000; 3000; 60] ) ) = 1
```

Beam rebar input parameters:

```
excel_IN( "no" , "BMCR.xlsx" , "BMCR" , "B21" , eval( [300 30; 300 30] ) ) = 1
```

Starting guess for depth of uncracked concrete:

```
excel_IN( "no" , "BMCR.xlsx" , "BMCR" , "C18" , 450 ) = 1
```

I would like to "solve" the section by varying cell C18 in order to make cell J20 zero (see next page)

R\C	- A -	- B -	- C -	- D -	- E -	- F -	- G -	- H -	- I -	- J -
- 6 -	***Analysis Options***									
- 7 -	b	1000	mm	f'c	35	Mpa		Es	200000	Mpa
- 8 -	h	3000	mm	γc	2350	kg/m³		n	1	
- 9 -	cover	60	mm	Ec	25456	Mpa		effective - Es/Ec	7.857	
- 10 -								effective - E.c.e	25456	Mpa
- 11 -										
- 12 -	***Geometry***	***INPUT:***								
- 13 -					E.s/E.c.e to E.c			E.s/E.c	-ratio-	7.857
- 14 -		width	thickness	y-centr	A	I.x	A x d^2	y.bar ↓	mm	532
- 15 -		mm	mm	mm	mm²	mm⁴	mm⁴	y.bar ↑	mm	2468
- 16 -	concrete 1	1000	50.0	2975	50000	1.04E+07	1.28E+10	I.x - concrete	mm⁴	4.601E+11
- 17 -	not used	1000	0.0001	2950	0.1	8.33E-11	2.32E+04	I.x - steel	mm⁴	5.857E+10
- 18 -	concrete 2	1000	450.0	2725	450000	7.59E+09	2.97E+10	uncr. concrete thickness		500
- 19 -	not used	1000	0.0001	2500	0.1	8.33E-11	1.01E+02		NA location	532
- 20 -	not used	1000	0.0001	2500	0.1	8.33E-11	1.01E+02		difference	-32
- 21 -	steel.comp	300.00	30	2905	61709.3	5.45E+05	1.18E+10	**e.y.steel.comp**	**mm**	**436.7**
- 22 -	steel.tens	300.00	30	95	70709.3	6.25E+05	3.98E+11	**e.y.steel.tens**	**mm**	**2373.3**
- 23 -										
- 24 -										

```
excel_EMF( "BMCR.xlsx" , "BMCR" , "A6:J24" , 8 )
```

```
Cracked  Section  Properties:
```

$I_{cr\_eff\_steel} := \text{excel\_OUT}(\text{"BMCR.xlsx"}, \text{"BMCR"}, \text{"J17"})\ mm^4 = 5.857 \cdot 10^{10}\ mm^4$

$e_{cr\_steel} := \text{excel\_OUT}(\text{"BMCR.xlsx"}, \text{"BMCR"}, \text{"J22"})\ mm = 2373.275\ mm$

$y_{bar\_cr} := \text{excel\_OUT}(\text{"BMCR.xlsx"}, \text{"BMCR"}, \text{"J15"})\ mm = 2468.27\ mm$

I am hoping to use FindRoot() to solve the following eqution:

FCR(DC#):= excel_IO("BMCR.xlsx" , "BMCR" , "C18" , DC# , "J20")

FCR(450) = -31.72

FindRoot(FCR(DC) = 0 , DC = 450) =

NewtonRaphson$_{CD}$(FCR(DC) = 0 , DC = 450) =

As you can see it is not working likely because for function excel_IO is executed before variable DC is subsitutued; as a result cell C18 is equal to "DC" and not a number:

R\C	- A -	- B -	- C -	- D -	- E -	- F -	- G -	- H -	- I -	- J -
- 6 -	***Analysis Options***									
- 7 -	b	1000	mm	f'c	35	Mpa		Es	200000	Mpa
- 8 -	h	3000	mm	γc	2350	kg/m³		n	1	
- 9 -	cover	60	mm	Ec	25456	Mpa		effective - Es/Ec	7.857	
- 10 -								effective - E.c.e	25456	Mpa
- 11 -										
- 12 -	***Geometry***	***INPUT:***								
- 13 -					E.s/E.c.e to E.c			E.s/E.c	-ratio-	7.857
- 14 -		width	thickness	y-centr	A	I.x	A x d^2	y.bar ↓	mm	#NAME?
- 15 -		mm	mm	mm	mm²	mm⁴	mm⁴	y.bar ↑	mm	#NAME?
- 16 -	concrete 1	1000	50.0	2975	50000	1.04E+07	#NAME?	I.x - concrete	mm⁴	#NAME?
- 17 -	not used	1000	0.0001	2950	0.1	8.33E-11	#NAME?	I.x - steel	mm⁴	#NAME?
- 18 -	concrete 2	1000	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	uncr. concrete thickness		#NAME?
- 19 -	not used	1000	0.0001	#NAME?	0.1	8.33E-11	#NAME?		NA location	#NAME?
- 20 -	not used	1000	0.0001	#NAME?	0.1	8.33E-11	#NAME?		difference	#NAME?
- 21 -	steel.comp	300.00	30	2905	#NAME?	#NAME?	#NAME?	**e.y.steel.comp**	**mm**	**#NAME?**
- 22 -	steel.tens	300.00	30	95	#NAME?	#NAME?	#NAME?	**e.y.steel.tens**	**mm**	**#NAME?**
- 23 -										
- 24 -										

excel_EMF("BMCR.xlsx" , "BMCR" , "A6:J24" , 8)

I wrote a quick NR solver myself, which works, but hey figured it is worth asking if I can use FindRoot() for iterative solution.