

Excel for Partial Differential Equations

1 Advanced Engineering Mathematics

1. EXCEL Application (Diffusion Equation , Partial Differential Equation)

Problem

A 1 - m - long, laterally insulated rod, originally at 60 °C, is subjected at one end to 500 °C. Estimate the temperature in the rod as a function of time if the diffusivity is $2 \times 10^{-6} \text{ m}^2 / \text{s}$ and the other end is held at 60 °C, respectively. Diffusivity is $2 \times 10^{-6} \text{ m}^2 / \text{s}$. Use five displacement steps with a time of 4ks.

Solution

Using diffusion equation and differencing the PDE equation, we get

$$T_{i,j+1} = \frac{ka}{h^2} (T_{i+1,j} - 2T_{i,j} + T_{i-1,j})$$

$$\text{Initial condition : } T(x,0) = 60$$

$$\text{Bound condition : } T(0,0) = 500$$

$$T(1,0) = 60$$

1 Advanced Engineering Mathematics

1. EXCEL Application (Diffusion Equation of Partial Differential Equation)

Microsoft Excel - Book1

파일(F) 편집(E) 보기(V) 삽입(I) 서식(O) 도구(T) 데이터(D) 창(W) 도움말(H)

동음 11 가 가 가 W % .00 .00 가

B2 $f_x = 0.2*(C1-2*B1+A1)+B1$

	A	B	C	D	E	F	G	H
1	500	60	60	60	60	60		
2	500	148	60	60	60	60		
3	500	200.8	77.6	60	60	60		
4	500	236	98.72	63.52	60	60		
5	500	261.344	119.136	69.856	60.704	60		
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그리기(B) 도형(U) 합계=1695.68

1 Advanced Engineering Mathematics

1. EXCEL window

Microsoft Excel - Book1

파일(F) 편집(E) 보기(V) 삽입(I) 서식(O) 도구(T) 데이터(D) 창(W) 도움말(H)

문음 11 가 가 가 W % 0% 0%

	A	B	C	D	E	F	G	H
82	500	411,7451	323,5876	235,5876	147,7451	60		
83	500	411,7646	323,6191	235,6191	147,7646	60		
84	500	411,7826	323,6482	235,6482	147,7826	60		
85	500	411,7992	323,675	235,675	147,7992	60		
86	500	411,8145	323,6999	235,6999	147,8145	60		
87	500	411,8287	323,7228	235,7228	147,8287	60		
88	500	411,8418	323,744	235,744	147,8418	60		
89	500	411,8539	323,7635	235,7635	147,8539	60		
90	500	411,865	323,7816	235,7816	147,865	60		
91	500	411,8753	323,7983	235,7983	147,8753	60		
92	500	411,8849	323,8137	235,8137	147,8849	60		
93	500	411,8936	323,8279	235,8279	147,8936	60		
94	500	411,9018	323,8411	235,8411	147,9018	60		
95	500	411,9093	323,8532	235,8532	147,9093	60		
96	500	411,9162	323,8644	235,8644	147,9162	60		
97	500	411,9226	323,8748	235,8748	147,9226	60		
98	500	411,9285	323,8843	235,8843	147,9285	60		
99	500	411,934	323,8932	235,8932	147,934	60		
100	500	411,939	323,9013	235,9013	147,939	60		
101	500	411,9437	323,9089	235,9089	147,9437	60		

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그리기(B) 도형(U) 준비

1 Advanced Engineering Mathematics

2. EXCEL Application (Laplace Equation , Partial Differential Equation)

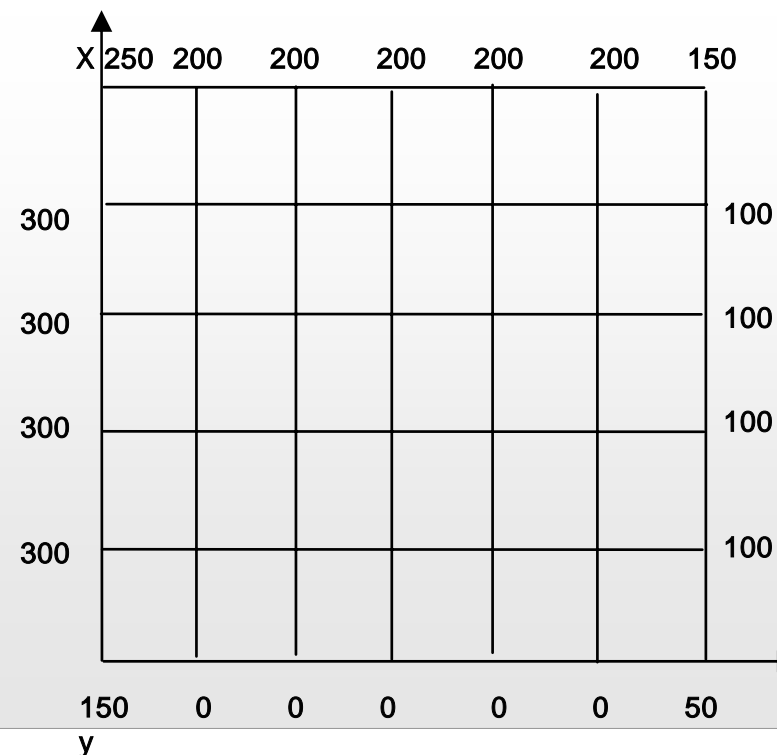
Problem

A 50 - X 60 - mm flat plate, insulated on both flat surfaces, has its edges maintained at 0, 100, 200, and 300 , in that order, going counterclockwise. Using

the relaxation method, determine the steady - state temperature at each grid point, using 10 - X10 - mm grid.

Solution

Using Laplace equation



1 Advanced Engineering Mathematics

2. EXCEL window (Laplace Equation)

Microsoft Excel - Book2

파일(F) 편집(E) 보기(V) 삽입(I) 서식(O) 도구(T) 데이터(D) 창(W) 도움말(H)

11 | 가 가 가 | W % | % % | 가

B 12 | =0.25*(B1+A2+C2+B3)

	A	B	C	D	E	F	G	H
1	250	200	200	200	200	200	150	
2	300	290	270	240	200	150	100	
3	300	280	250	220	180	130	100	
4	300	200	150	100	100	100	100	
5	300	50	50	50	50	50	100	
6	150	0	0	0	0	0	50	
7								
8								
9								
10								
11	250	200	200	200	200	200	150	
12	300	262.5	245	222.5	192.5	157.5	100	
13	300	260	230	192.5	162.5	132.5	100	
14	300	195	150	130	107.5	95	100	
15	300	137.5	62.5	50	50	62.5	100	
16	150	0	0	0	0	0	50	
17								
18								
19								
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Sheet1 / Sheet2 / Sheet3

준비

