Adamu Yusuf
17/ENG02/003
Computer engineering

$U_t = C(U_{xx}) = 0$

$dU/dt = C(d^2u/dx^2) = 0$

$\frac{dy}{dt} = C\frac{d^2y}{dx^2}$

$\frac{U_{ij+1} - U_{ij}}{\Delta t} = C\left(\frac{U_{i+1,j} - 2U_{ij} + U_{i-1,j}}{\Delta x^2}\right)$

$U_{ij+1} - U_{ij} = C\left(\Delta t\left[U_{i+1,j} - 2U_{ij} + U_{i-1,j}\right] \cdot \frac{\Delta t}{\Delta x^2}\right)$

$= 1$

$U(x,0) = x^4 k$ - - - (1)

$\Delta x = 0.2$, $\Delta t = 0.02$ day

for K initial condition

At $x = 0 \rightarrow x^4 = 0$

At $x = 0.2 \rightarrow 0.2^4 = 1.6 \times 10^{-3}$

At $x = 0.4 \rightarrow 0.4^4 = 0.025 6$

At $x = 0.6 \rightarrow 0.6^4 = 0.129 6$

At $x = 0.8 \rightarrow 0.8^4 = 0.409 6$

At $x = 1 \rightarrow 1^4 = 1$

$U_{ij+1} = U_{ij} + C\left[U_{i+1,j} - 2U_{ij} + U_{i-1,j}\right]$

$U_{i,j+1} = [U_{i-1,j} + (1-2r)U_{i,j} + rU_{i+1,j}]$ — (1)

when $i = 1, j = 0$

$U_{1,1} = 0.5 U_{0,0} + 0.5 U_{2,0}$

$= 0.5(0) + 0.5(0.0256)$

$U_{1,1} = 0.0128$

When $i = 2, j = 0$

$U_{2,1} = 0.5(U_{1,0}) + 0.5(U_{3,0})$

$= 0.5(1.6 \times 10^{-3}) + 0.5(0.1296)$

$U_{2,1} = 0.0656$

When $i = 3, j = 0 = U_{3,1} = 0.5(U_{2,0}) + 0.5(U_{4,0})$

$= 0.5(0.0256) + 0.5(0.4096)$

$U_{3,1} = 0.2176$

When $i = 4, j = 0 = U_{4,1} = 0.5(U_{3,0}) + 0.5(U_{5,0})$

$= 0.5(0.256) + 0.5(0.4096)$

$U_{4,1} = 0.5648$

for $j = 1$

When $i = 1$:- $U_{1,2} = 0.5(U_{0,1})$

$= 0.5 U_{0,1} + 0.5 U_{2,1} = 0 + 0.5(0.0656)$

$U_{3,2} = 0.0328$

When $i = 2$: $U_{2,2} = 0.5(U_{1,1}) + 0.5(U_{3,1})$

$0.5(0.0128) + 0.5(0.2176)$

$U_{2,2} = 0.1152$

Where $i = 3$: $U_{3,2} = 0.5(U_{2,1}) + 0.5(U_{4,1})$

$0.5(0.0656) + 0.5(0.5648)$

$U_{3,2} = 0.3152$

When $i = 4$ $U_{4,2} = 0.5(U_{3,1}) + 0.5(U_{5,1})$

$= 0.5(0.2176) + 0.5(1)$

$U_{4,2} = 0.6088$

For $j = 2$

When $i = 1$: $U_{1,3} = 0.5(U_{0,2}) + 0.5(U_{2,2})$

$= 0 + 0.5(0.1152) = 0.0576$

When $i = 2$, $U_{2,3} = 0.5(U_{1,2}) + 0.5(U_{3,2})$

$= 0.5(0.0328) + 0.5(0.3152)$

$= 0.174$

when i = 3 : $U_{3,3} = 0.5(U_{4,2}) + 0.5(U_{4,4})$

$= 0.5(0.1152) + 0.5(0.6000)$

$= 0.3632$

when i = 4 $U_{4,3} = 0.5(U_{3,2}) + 0.5(U_{3,4})$

$= 0.5(0.3152) + 0.5(1)$

$U_{4,3} = 0.6576$

for j = 3

when $i = 1$ $U_{1,4} = 0.5(U_{1,3}) + 0.5(U_{1,5})$

$= 0.5(0) + 0.5(0.1724)$

$= 0.0862$

when $i = 2$ $U_{2,4} = 0.5(U_{1,3}) + 0.5(U_{1,5})$

$= 0.5(0.05762) + 0.5(0.3632)$

$= 0.2098$

when $i = 3$ $U_{3,4} = 0.5(U_{2,3}) + 0.5(U_{4,3})$

$= 0.5(0.1724) + 0.5(0.6576)$

$= 0.4150$

When i = 4 $U_{4,4} = 0.5(U_{3,3}) + 0.5(U_{4,4})$

$= 0.5(0.3162) + 0.5(1)$

$= 0.6581$

For j = 4

When i = 1 $U_{1,5} = 0.5(U_{0,4}) + 0.5(U_{1,4})$

$= 0.5(0.2098) = 0.1049$

When i = 2 $U_{2,5} = 0.5(U_{1,4}) + 0.5(U_{3,4})$

$= 0.5(0.082) + 0.5(0.4908)$

$= 0.2514$

When i = 3 $U_{3,4} = 0.5(U_{3,3}) + 0.5(U_{4,4})$

$= 0.5(0.2098) + 0.5(0.6811)$

$= 0.4954$

When i = 4 $U_{4,5} = 0.5(U_{3,4}) + 0.5(U_{4,4})$

$= 0.5(0.4958) + 0.5(1)$

$= 0.7079$

	Ω2	3/Kmp(x)						
	0.1	5	0	0.1049	0.2514	0.4454	0.267	1
	0.08	4	0	0.087	0.2098	0.4058	0.621	1
	0.06	3	0	0.0526	0.124	0.312	0.561	1
	0.04	2	0	0.0328	0.1152	0.3152	0.6008	1
	0.02	1	0	0.0128	0.0656	0.2126	0.5641	1
	0	0	0	0.0016	0.028	0.1296	0.4016	1
	Δx		0	0.2	0.4	0.6	0.8	1
		i	0	1	2	3	4	5

0.1	0	0.1049	0.2514	0.4454	0.7079	1
0.08	0	0.087	0.2098	0.4158	0.681	1
0.06	0	0.0576	0.174	0.362	0.6576	1
0.04	0	0.0328	0.1152	0.3152	0.6088	1
0.02	0	0.0128	0.0656	0.2176	0.5648	1
0	0	0.0016	0.0256	0.1296	0.4096	1
	0	0.2	0.4	0.6	0.8	1

0.5