

(1) - Aleyemo Ullle.
17/engosob

$$1.) U_0 - (U_{rc} = 0)$$

$$\frac{\partial u}{\partial t} = c \frac{\partial^2 u}{\partial x^2} = 0$$

$$\frac{\partial u}{\partial t} = \frac{c \partial^2 u}{\partial x^2}$$

$$\frac{u_{i,j+1} - u_{i,j}}{\Delta t} = \frac{c}{\Delta x^2} (u_{i+1,j} - 2u_{i,j} + u_{i-1,j})$$

$$u_{i,j+1} - u_{i,j} = \frac{c \Delta t}{\Delta x^2} (u_{i+1,j} - 2u_{i,j} + u_{i-1,j}) \times \left[\frac{\Delta t}{\Delta x^2} \right]$$

$$u(x, 0) = x^4 k$$

$$\Delta x = 0.2 \text{ m} \quad \Delta t = 0.02 \text{ day}$$

Initial conditions

$$\text{At } x=0 \rightarrow x^4 = 0$$

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

$$\text{II } x=0.4 \rightarrow 0.4^4 = 0.256$$

$$\text{III } x=0.6 \rightarrow 0.6^4 = 0.1296$$

$$\text{IV } x=0.8 \rightarrow 0.8^4 = 0.4096$$

$$\text{V } x=1 \rightarrow 1^4 = 1$$

$$u_{i,j+1} = r (u_{i+1,j} - 2u_{i,j} + u_{i-1,j})$$

$$u_{i,j+1} = r u_{i-1,j} + (1-2r) u_{i,j} + u_{i+1,j}$$

when $t=1, j=0$

$$u_{i+1} = 0.5 u_{0,0} + 0.5 u_{2,0}$$
$$= 0.5(0) + 0.5(0.256)$$

$$u_{i+1} = 0.128$$

when $t=2, j=0$

$$u_{2,1} = 0.5(u_{1,0}) + 0.5(u_{3,0})$$
$$= 0.5(1.6 \times 10^{-3}) + 0.5(0.1296)$$

$$u_{2,1} = 0.0656$$

$$\text{When } i = 3, j = 0: U_{3,1} = 0.5(U_{2,0}) + 0.5(U_{4,0}) \\ = 0.5(0.0256) + 0.5(0.4096)$$

$$U_{3,1} = 0.2176$$

$$\text{When } i = 4, j = 0: U_{4,1} = 0.5(U_{3,0}) + 0.5(U_{5,0}) \\ = 0.5(0.0256) + 0.5(0.4096) \\ = U_{4,1} = 0.5648$$

for $j = 1$

$$\text{when } i = 1: U_{1,2} = 0.5(0.1) + 0.5(U_{2,1}) \\ = 0.5U_{0,1} + 0.5U_{2,1} = 0 + 0.5(0.0656)$$

$$U_{1,2} = 0.0328$$

$$\text{when } i = 2: U_{2,2} = 0.5(U_{1,1}) + 0.5(U_{3,1}) \\ = 0.5(0.0128) + 0.5(0.2176)$$

$$U_{2,2} = 0.1152$$

$$\text{when } i = 3: U_{3,2} = 0.5(U_{0,1}) + 0.5(U_{4,1}) \\ = 0.5(0.0656) + 0.5(0.5648)$$

$$U_{3,2} = 0.3152$$

$$\text{when } i = 4: U_{4,2} = 0.5(U_{2,1}) + 0.5(U_{5,1}) \\ = 0.5(0.2176) + 0.5(1)$$

$$U_{4,2} = 0.6088$$

$$\frac{j = 2}{\text{when } i = 1: U_{1,3} = 0.5(U_{0,2}) + 0.5(U_{2,2}) \\ = 0 + 0.5(0.1152) = 0.0576}$$

$$\text{when } i = 2: U_{2,3} = 0.5(U_{1,2}) + 0.5(U_{3,2}) \\ = 0.5(0.0576) + 0.5(0.3152) \\ = 0.2098$$

$$\text{when } i = 3: U_{3,3} = 0.5(U_{2,2}) + 0.5(U_{4,2}) \\ = 0.5(0.2176) + 0.5(0.6088) \\ = 0.4158$$

When $i=9$

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

$$= 0.5(0.362) + 0.5(1)$$

$$= 0.681 //$$

For $j=4$

when $\tau=1 = 0.1049$

when $\tau=2 = 0.2514$

when $\tau=3 = 0.4454$

when $\tau=4 = 0.5(U_{3,4}) + 0.5(U_{5,4})$

$$= 0.5(0.4158) + 0.5(1)$$

$$= 0.7079$$

Δt	j Temperature (K)						
0.1	5	0	0.1049	0.2514	0.4454	0.7079	1
0.08	4	0	0.592	0.174	0.362	0.6526	1
0.06	3	0	0.318	0.1152	0.3152	0.6008	1
0.04	2	0	0.0198	0.0656	0.9196	0.5698	1
0.2	1	0	0.016	0.0628	0.1246	0.4076	1
0	0	0	0.2	0.4	0.6	0.8	1
Δx		0	1	2	3	4	5