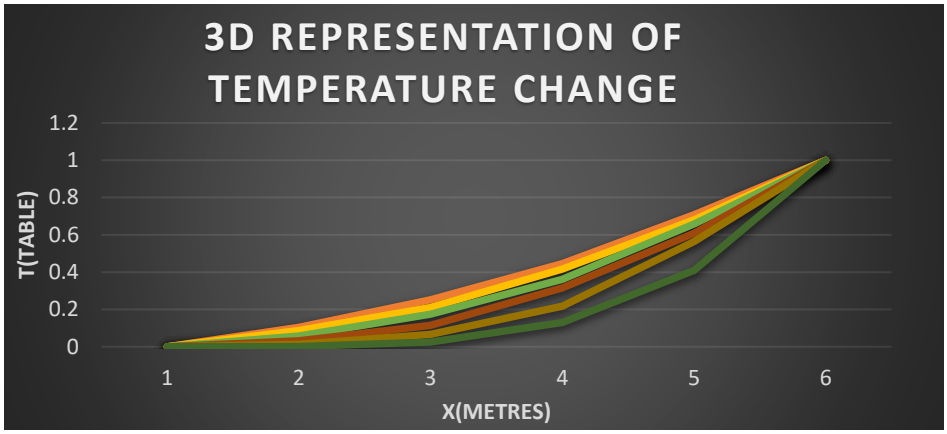
	0.1	0	0.1049	0.2514	0.4454	0.7079	1
	0.08	0	0.087	0.2098	0.4158	0.681	1
	0.06	0	0.0576	0.174	0.362	0.6576	1
	0.04	0	0.0328	0.1152	0.3152	0.6088	1
	0.02	0	0.0128	0.0656	0.2176	0.5648	1
	0	0	0.0016	0.0256	0.1296	0.4096	1
		0	0.2	0.4	0.6	0.8	1
0.5							



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MATRIC NO: 18/ENG02/102

DEPARTMENT: COMPUTER ENGINEERING

ENGINEERING MATHEMATICS (III)

$$U_t - CU_{xx} = 0$$

$$\frac{dy}{dt} - C\frac{d^2y}{dx^2} = 0$$

$$\frac{du}{dt} = C\frac{d^2u}{dx^2}$$

$$\frac{U_{i,j+1} - U_{i,j}}{\Delta t} = C \cdot \frac{U_{i+1,j} - 2U_{i,j} + U_{i-1,j}}{\Delta x^2}$$

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

$$U_{i,j+1} - U_{i,j} = \frac{C\Delta t}{\Delta x^2}\left[U_{i+1,j} - 2U_{i,j} + U_{i-1,j}\right] \cdot r_2 \frac{\Delta t}{\Delta x^2}, \quad C = 1$$

$$U[x,0] = x^4 K.$$

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

for initial conditions

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

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

$i=2, u_{2,1} = r u_{1,0} + (1-2r) u_{2,0} + r u_{2,0}$

$0.5(0.4) + (1-2\times0.8)\,0.8 + 0.5(0.8)$

$= 0.2 + 0.4 = 0.6$

$i=3, u_{3,1} = r u_{2,0} + (1-2r) u_{3,0} + r u_{4,0}$

$= 0.5(0.8) + (0)\,0.8 + 0.5(0.4$

$0.4 + 0 + 0.2 = 0.6$

$i=4, u_{4,1} = r u_{3,0} + (1-2r) u_{4,0} + r u_{5,0}$

$=$

$j=1$

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

$i=1 \quad u_{1,2}$

$i=2 \quad u_{2,2}$

$i=3 \quad u_{3,2}$

$i=4 \quad u_{4,2}$

$j=2$ . . .

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

for $j=1$

when $i=1$ $\therefore u_{1,2} = 0.5(0,1) + 0.5(u_2,1)$

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

$u_{1,2} = 0.0328$

when $i=2$ $\therefore u_{2,2} = 0.5(u_{1,1}) + 0.5(u_{3,1})$

$= 0.5(0.0128) + 0.5(0.2176)$

$u_{2,2} = 0.1152$

when $i=3$ $\therefore u_{3,2} = 0.5(u_{0,1}) + 0.5(u_{4,1})$

$0.5(0.0656) + 0.5(0.5648)$

$u_{3,2} = 0.3152$

when $i=4$ $\therefore u_{4,2} = 0.5(u_{2,1}) + 0.5(u_{5,1})$

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

$u_{4,2} = 0.6088$

for $J=2$

when $i=1$ $\therefore u_{1,3} = 0.5(u_{0,1}) + 0.5(u_{2,2})$

$= 0 + 0.5(0.1152) = 0.0576$

when $i=2$ $\therefore u_{2,3} = 0.5(u_{1,2}) + 0.5(u_{3,2})$

$= 0.5(0.0328) + 0.5(0.3152) = 0.174$

when $i=3$ $\therefore u_{3,3} = 0.5(u_{2,2}) + 0.5(u_{4,2})$

$= 0.5(0.1152) + 0.5(0.6088) = 0.362$

when $i=4$ $\therefore u_{4,3} = 0.5(u_{3,2}) + 0.5(u_{5,2})$

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

$u_{4,3} = 0.6576$

For J = 3

when i = 1 $u_{1,4} = 0.5(u_{0,3}) + 0.5(u_{2,3})$.

$= 0.5(0) + 0.5(0.174) = 0.084$

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

$= 0.5(0.0576) + 0.5(0.362) = 0.2098$

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

$= 0.5(0.174) + 0.5(0.6576) = 0.4158$

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

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

$= 0.681$

For J = 4

when i = 1 $u_{1,5} = 0.5(u_{0,4}) + 0.5(u_{2,4})$

$= 0.5(0.2098) = 0.1049$

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

$= 0.5(0.087) + 0.5(0.4158) = 0.2514$

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

$0.5(0.2098) + 0.5(0.681)$

$= 0.4454$

when $i=4$ $\quad u_{4,5} = 0.5(u_{3,4}) + 0.5(u_{5,4})$

$0.5(0.24158) + 0.5(1)$

$= 0.7079$