

NAME: ABBEY FLOURISH OBARI-AKASE

MATRIC NUMBER:- 16/ENG041001

DEPARTMENT:- ELECTRICAL/ELECTRONICS ENGINEERING

COURSE :- ENGINEERING MATHEMATICS IV [ENG 382]

ASSIGNMENT 7

$$C = 2.2 \frac{\text{cm}^3}{\text{hr}}$$

$$\Delta x = 0.3 \text{ cm} \quad \Delta t = 0.02 \text{ hr}$$

$$\bar{c} = \frac{2.2 (0.02)}{(0.3)^2} = 0.4889$$

$$\tau = 0.49 \quad T_{i,j+1} = T_{i,j} = 0.49 [T_{i+1,j} - 2T_{i,j} + T_{i-1,j}]$$

$$T_{i,j+1} = 0.49 T_{i+1,j} - 0.98 T_{i,j} + T_{i,j} + 0.49 T_{i-1,j}$$

$$T_{i,j+1} = 0.49 T_{i+1,j} + 0.02 T_{i,j} + 0.49 T_{i-1,j}$$

$$\Rightarrow T_{i,j+1} = 0.49 T_{i+1,j} + 0.02 T_{i,j} + 0.49 T_{i-1,j}$$
$$= 0.49 T_{i+1,j} + 0.02 (1 - 2 \times 0.49) T_{i,j} + 0.49 T_{i-1,j}$$

$$\text{for } t=0, \quad T(x,0) = 3x^2$$

1. where $x = 0 \text{ cm}$

$$T(0,0) = x_0 = 3 \times (0)^2 = 0 \text{ cm}$$

2. where $x = 0.3 \text{ cm}$

$$T(0.3,0) = x_1 = 3 \times (0.3)^2 = 0.27 \text{ cm}$$

3. where $x = 0.6 \text{ cm}$

$$T(0.6,0) = x_2 = 3 \times (0.6)^2 = 1.08 \text{ cm}$$

4. where $x = 0.9 \text{ cm}$

$$T(0.9,0) = x_3 = 3 \times (0.9)^2 = 2.43 \text{ cm}$$

5. where $x = 1.2 \text{ cm}$

$$T(1.2,0) = x_4 = 3 \times (1.2)^2 = 4.32 \text{ cm}$$

----- till $x = 6.0 \text{ cm}$

for the second row,

$$\bar{T}_{i,j+1} = 0.49 \bar{T}_{i+1,j} + (1 - 2 \times 0.49) \bar{T}_{i,j} + 0.49 \bar{T}_{i-1,j}$$

$$\Rightarrow \bar{T}_{i,j+1} = 0.49 \bar{T}_{i+1,j} + 0.02 \bar{T}_{i,j} + 0.49 \bar{T}_{i-1,j}$$

where $i=1, j=0$

$$\bar{T}_{1,1} = 0.49 \bar{T}_{2,0} + 0.02 \bar{T}_{1,0} + 0.49 \bar{T}_{0,0}$$

$$\bar{T}_{1,1} = 0.49 \times (1.08) + 0.02(0.27) + 0.49(0)$$

$$\bar{T}_{1,1} = 0.5436$$

where $i=2, j=0$

$$\bar{T}_{2,1} = 0.49 \bar{T}_{3,0} + 0.02 \bar{T}_{2,0} + 0.49 \bar{T}_{1,0}$$

$$\bar{T}_{2,1} = 0.49 (2.43) + 0.02(1.08) + 0.49(0.27)$$

$$\bar{T}_{2,1} = 1.3446$$

where $i=3, j=0$

$$\bar{T}_{3,1} = 0.49 \bar{T}_{4,0} + 0.02 \bar{T}_{3,0} + 0.49 \bar{T}_{2,0}$$

$$\bar{T}_{3,1} = 0.49 (4.32) + 0.02(2.43) + 0.49(1.08)$$

$$\bar{T}_{3,1} = 2.6946$$

where $i=4, j=0$

$$\bar{T}_{4,1} = 0.49 \bar{T}_{5,0} + 0.02 \bar{T}_{4,0} + 0.49 \bar{T}_{3,0}$$

$$\bar{T}_{4,1} = 0.49 (6.75) + 0.02(4.32) + 0.49(2.6946)$$

$$\bar{T}_{4,1} = 4.5846$$

where $i=5, j=0$

$$\bar{T}_{5,1} = 0.49 \bar{T}_{6,0} + 0.02 \bar{T}_{5,0} + 0.49 \bar{T}_{4,0}$$

$$\bar{T}_{5,1} = 0.49 (9.72) + 0.02(6.75) + 0.49(4.5846)$$

$$\bar{T}_{5,1} = 7.0146$$

Ull $\bar{T}_{20,1}$