Exam-3rd Sem Chemical engineering CBGS

Subject-Computer programming and numerical method

Exam Date-07/12/2017

QP code 24945

Q 6a) runge kutta ans 0.9655827899

6 b) eulers answer 0.81697

Q 5a) regula falsi answer 1.5320

Q 5 c) convergence-matrix should be digonically dominant

Q 4b) ans 1.32471

Q 3 b)crank Nicholson answewr-

Solution

Let $\Delta x = 0.2$, $\Delta t = 0.5$, we have

$$d = \frac{\alpha \Delta t}{(\Delta x)^2} = \frac{(0.02)(0.5)}{(0.2)^2} = 0.25 \leq \frac{1}{2}$$

Substituting d into the equation

$$-d\,T_{i-1}^{n+1} + 2(1+d)\,T_i^{n+1} - d\,T_{i+1}^{n+1} = d\,T_{i-1}^{n} + 2(1-d)\,T_i^{n} + d\,T_{i+1}^{n}$$

we obtain

$$-0.25\,T_{i-1}^{n+1} + 2.5\,T_i^{n+1} - 0.25\,T_{i+1}^{n+1} = 0.25\,T_{i-1}^{n} + 1.5\,T_i^{n} + 0.25\,T_{i+1}^{n}$$

The initial conditions for the problem are given in the following table:

i	1	2	3	4	5	6
*t**x*	0	0.2	0.4	0.6	0.8	1.0
0	0	20	40	60	80	100
0.5	0					

Due to the symmetry with respect to node *i* = 6, we have

$$-0.5\,T_5^{n+1} + 2.5\,T_6^{n+1} = 0.5\,T_5^{n} + 1.5\,T_6^{n}$$

The temperatures at the time *t* = 0.5 are the solutions of the following equations:

i = 2		$2.5T_2$	$-0.25\,T_3$	=	40
i = 3	$-0.25\,T_2$	$+2.5T_3$	$-0.25\,T_4$	=	80
i = 4	$-0.25\,T_3$	$+2.5T_4$	$-0.25\,T_5$	=	120
i = 5	$-0.25\,T_4$	$+2.5T_5$	$-0.25\,T_6$	=	160
i = 6	$-0.25\,T_5$	$+2.5T_6$		=	190

The results for the above set of equations are listed in the following table:

i	1	2	3	4	5	6
*t**x*	0	0.2	0.4	0.6	0.8	1.0
0	0	20	40	60	80	100
0.5	0	20	39.99	59.92	79.18	91.84

Q2 a) difference equation $U_n = 2-(1/2)^n$ this is the answer

Q 2 b) secant method 1.3247 is answer

Q 1b) gauss Jordon method $x = 3, y = 4, z = -2$. Is answer