Unit 6 - Week 04

Assignment 4

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-08-28, 23:59 IST.

1) The 2nd order accurate forward difference formula for y_i' using y_i, y_{i+1}, y_{i+2} is *1 point*

a. $\frac{4y_{i+1}-3y_i-y_{i+2}}{(\Delta x)^2}$
b. $\frac{4y_{i+1}-3y_i-y_{i+2}}{2\Delta x}$
c. $\frac{3y_{i+1}-4y_i+y_{i+2}}{2\Delta x}$
d. $\frac{4y_{i+2}-3y_i-y_{i+1}}{2\Delta x}$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

2) The 2nd order accurate backward difference formula for y_i' using y_i, y_{i-1}, y_{i-2} is *1 point*

a. $\frac{4y_{i-1}-3y_i-y_{i-2}}{2\Delta x}$
b. $\frac{3y_i+y_{i-2}-4y_{i-1}}{(\Delta x)^2}$
c. $\frac{4y_{i-1}-3y_i-y_{i-2}}{(\Delta x)^2}$
d. $\frac{3y_i+y_{i-2}-4y_{i-1}}{2\Delta x}$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
d

3) **COMMON DATA QUESTION 3-4:** *1 point*

Consider the PDE: $\frac{\partial^2 u}{\partial t^2}=\frac{\partial^2 u}{\partial x^2}, 0\le x\le 1, t\ge 0$ with the boundary conditions $u(0,t)=0=u(1,t)$ and the initial conditions $u(x,0)=\sin(\pi x), \frac{\partial u(x,0)}{\partial t}=0$. For step size $\Delta x=0.2$, $\Delta t=0.1$ and use central difference approximation for the derivative in the initial condition.

The solution for $u(0.2,0.2)$ by explicit method is

a. 0.4721
b. 0.5062
c. 0.4391
d. 0.6455

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

4) The solution for $u(0.4,0.2)$ by explicit method is *1 point*

a. 1.1583
b. 0.9864
c. 0.7704
d. 0.8346

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

5) **Common Data QUESTION 5-6:** *1 point*

Consider the following PDE: $u_t=u_{xx}, 0\le x\le 1, t\ge 0$, $u(x,0)=x$ for $0<x<1$ and $\frac{\partial u(0,t)}{\partial x}=0, \frac{\partial u(1,t)}{\partial x}=1$ for $t\ge 0$ with step size $\Delta x=\frac{1}{3}$ and $\Delta t=\frac{1}{9}$.

The value of $u\left(0,\frac{1}{9}\right)$ for FTCS scheme is

a. 0.984
b. 0.792
c. 0.552
d. 0.667

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
d

6) The value of $u\left(1,\frac{1}{9}\right)$ for FTCS scheme is *1 point*

a. 1.25
b. 1.16
c. 1.0
d. 0.92

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

7) **COMMON DATA QUESTION 7-8:** *1 point*

Consider the following PDE: $u_t=u_{xx}$ with $u(x,0)=1$ for $0<x<1$ and $u(0,t)=\frac{1}{2}, u(1,t)=0$ for $t\ge 0$. Here step size $\Delta x=\frac{1}{4}$ and $\Delta t=\frac{1}{32}$.

The solution for $u\left(\frac{1}{4},\frac{1}{32}\right)$ by BTCS scheme is

a. 0.848
b. 0.982
c. 1.284
d. 0.735

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

8) The solution for $u\left(\frac{3}{4},\frac{1}{32}\right)$ by BTCS scheme is *1 point*

a. 0.614
b. 0.723
c. 0.845
d. 0.427

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

9) **COMMON DATA QUESTION 9-11:** *1 point*

Consider the following PDE: $u_t=u_{xx}$ with $u(x,0)=\cos\left(\frac{\pi x}{2}\right)$ for $-1\le x\le 1$ and $u(-1,t)=u(1,t)=0$ for $t>0$. For the step size $\Delta x=\frac{1}{2}$ and $\Delta t=\frac{1}{8}$.

The truncation error of the above PDE for Crank-Nicolson scheme is

a. $O[(\Delta t),(\Delta x)]$
b. $O[(\Delta t),(\Delta x)^2]$
c. $O[(\Delta t)^2,(\Delta x)]$
d. $O[(\Delta t)^2,(\Delta x)^2]$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
d

10) The Crank-Nicolson scheme for the above PDE is *1 point*

a. Consistent and stable
b. Inconsistent and stable
c. Consistent and unstable
d. Inconsistent and unstable

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

11) The solution for $u\left(\frac{1}{2},\frac{1}{8}\right)$ by Crank-Nicolson scheme is *1 point*

a. 0.9526
b. 0.6826
c. 0.5265
d. 0.4218

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

12) **Common Data QUESTION 12-13:** *1 point*

Using ADI method, solve the following BVP: $u_{xx}+u_{yy}=0; 0\le x,y\le 12$, $u(0,y)=u(12,y)=100; 0\le y\le 12$ and $u(x,0)=100, u(x,12)=0; 0\le x\le 12$ with step size $\Delta x=\Delta y=4$, number of iteration is 1 and initial values for the interior mesh points as 100.

The truncation error of the above PDE is

a. $O[(\Delta x)^2,(\Delta y)^2]$
b. $O[(\Delta x),(\Delta y)^2]$
c. $O[(\Delta x)^2,(\Delta y)]$
d. $O[(\Delta x),(\Delta y)]$

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

13) The value of $u(8,8)$ is *1 point*

a. 50
b. 100
c. 150
d. 200

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

14) **COMMON DATA QUESTION 14-15:** *1 point*

Using Successive over-relaxation method, solve the following BVP: $u_{xx}+u_{yy}=0, 0\le x,y\le 7.5$, $u(0,y)=u(7.5,y)=0; 0\le y\le 7.5$ and $u(x,0)=0, u(x,7.5)=100, 0\le x\le 7.5$ with step size $\Delta x=\Delta y=2.5$ and relaxation parameter $\omega=1.24$. All the initial values of the internal mesh points is equal to 0.

The value of $u(2.5,2.5)$ for two steps of iteration is

a. 11.95
b. 9.61
c. 5.73
d. 20.63

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

15) The value of $u(5,5)$ for two steps of iteration is *1 point*

a. 38.21
b. 27.63
c. 32.59
d. 43.71

- a
- b
- c
- d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a