

X

NPTEL

reviewer2@nptel.iitm.ac.in ▼

Courses » Modeling Transport Phenomena of Microparticles

Announcements

Course

Ask a Question

Progress



Unit 9 - Week 8

Course outline

How to access the portal

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

- Lecture 36: Numerical Methods for transport equations, Part-I
- Lecture 37: Numerical Methods for transport equations, Part-II
- Lecture 38: Electrophoresis of charged colloids, Part-I
- Lecture 39 : Electrophoresis of charged colloids, Part-II
- Lecture 40 : Gel Electrophoresis
- Quiz : Week 8: Assignment
- Week 8 : study materials
- Week 8: Assignment solutions

Week 8: Assignment

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

Due on 2017-03-22, 23:59 IST

0 points

1) Use an iterative method to solve the nonlinear boundary value problem $\frac{d^2 y}{dx^2} = 2 + y^2$; $y(0) = y(1) = 0$; with step size h . At every iteration, the i^{th} row of the resulting tri-diagonal matrix is

- A) $-\frac{1}{2h^2}(y_{i+1}^k - y_{i-1}^k) - 2y_i^k + \frac{1}{2h^2}(y_{i+1}^k - y_i^k i - 1)$
- B) $\frac{1}{2h^2}(y_{i+1}^k - y_{i-1}^k) - 2y_i^k + \frac{1}{2h^2}(y_{i+1}^k - y_i^k i - 1)$
- C) $-\frac{1}{2h^2}(y_{i+1}^k - y_{i-1}^k) + 2y_i^k + \frac{1}{2h^2}(y_{i+1}^k - y_i^k i - 1)$
- D) $-\frac{1}{2h^2}(y_{i+1}^k - y_{i-1}^k) + 2y_i^k - \frac{1}{2h^2}(y_{i+1}^k - y_i^k i - 1)$

No, the answer is incorrect.

Score: 0

Accepted Answers:

A) $-\frac{1}{2h^2}(y_{i+1}^k - y_{i-1}^k) - 2y_i^k + \frac{1}{2h^2}(y_{i+1}^k - y_i^k i - 1)$

2) Solve

$$u_t = u_{xx}$$

$$u(x, 0) = \sin \pi x, \quad 0 < x < 1$$

$$u(0, t) = u(1, t) = 0, \quad t \geq 0$$

by explicit scheme with $r = \delta t / \delta x^2 = 1/6$, $\delta x = 1/4$.

Find the value of u_1^1 , where $u_i^n = u(x_i, t_n)$.

- A) -0.638071
- B) 0.3190085
- C) -0.3190085
- D) 0.638071

No, the answer is incorrect.

Score: 0

Accepted Answers:

D) 0.638071

3) Find the value of u_2^1 for problem 2.

- A) 0.461845
- B) 0.902369
- C) 1.385535
-

1 point

1 point

D) 0.638071

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

B) 0.902369

4) Find the value of u_3^1 for problem 2. 1 point

A) - 0.3190085

B) 0.3190085

C) 0.638071

D) - 0.638071

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

C) 0.638071

5) For the partial differential equation in problem 2, calculate the values of u_1^2 and u_2^2 . 1 point

A) 0.575775 and 0.814269

B) 0.2878875 and 0.4071345

C) 1.15155 and 1.628538

D) 0.575775 and 0.4071345

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

A) 0.575775 and 0.814269

6) The value of u_3^2 for the problem 2 is 1 point

A) 1.15155

B) 0.2878875

C) 0.575775

D) 0.814269

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

C) 0.575775

7) A spherical particle of radius $a=100$ nm with surface charge density $\sigma = 0.01602 C m^{-2}$ is suspended in a non conducting liquid i.e, Debye length λ is such that $a/\lambda \ll 1$. 1 point

The surface potential of the particle is

A) 4.607486 V

B) 9.214972 V

C) 1.1518715 V

D) 2.303743 V

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

D) 2.303743 V



8) Find the electrophoretic velocity due to an electric field $E_0 = 200 \text{ V/m}$ for the problem 7. **1 point**

-
- A) $4.272 \times 10^{-4} \text{ m/s}$
-
- B) $2.136 \times 10^{-4} \text{ m/s}$
-
- C) $4.272 \times 10^{-3} \text{ m/s}$
-
- D) $2.136 \times 10^{-3} \text{ m/s}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

B) $2.136 \times 10^{-4} \text{ m/s}$

9) If the particle described in problem 7 is suspended in an electrolyte of high ionic concentration i.e., $a/\lambda > 1$ (consider a 100 mol/m^3 NaCl solution), then the electrophoretic velocity due to an electric field E_0 is

-
- A) 0.02127186 m/s
-
- B) 0.01063593 m/s
-
- C) 0.04254372 m/s
-
- D) 0.2127186 m/s

No, the answer is incorrect.

Score: 0

Accepted Answers:

A) 0.02127186 m/s

10) For the problem 9, what will be the time taken by the particle to move a distance 10 cm ? **1 point**

-
- A) 3.38 hour
-
- B) 6.76 hour
-
- C) 9.38 hour
-
- D) 12.19 hour

No, the answer is incorrect.

Score: 0

Accepted Answers:

C) 9.38 hour



◀ Previous Page

End ▶



Powered by

