Submission Deadline : 22/11/2021 09:30

End-Sem Exam

Q.1 Which of the following is/are true:

A. The heat equations admit infinite speed of propogation.

B. The equation $u_t - \Delta(u^4) = 0$ leads to finite speed of propagation.

C. Any solution u of the equation $u_t + u_x = 0$ is constant along the line $x - t = 5$.

D. Any solution of the equation such

$$\begin{aligned} u_t - \Delta u &= 0 \text{ in } \Omega_T \\ u &= 0 \text{ on } \partial\Omega \times [0,T] \\ u &= g \text{ on } \Omega \times \{t=0\} \end{aligned}$$

Then $u > 0$ everywhere if g is positive somewhere.

Max. score: 8; Neg. score: 2

- A
- B
- D
- C

Q.2 Which of the following are/is true:

A. If u be any function which is bounded below by zero and harmonic in Ω then e^u is constant.

B. Every Harmonic function which is non-negative is analytic.

C. Any solution of the heat equation in Ω_T is smooth with respect to $x \in \Omega;\ t > 0$.

D. There exists an unbounded solution to the equation $-\Delta u = 2$ in $(0,a) \times (0,b)$ subject to zero Dirichlet boundary condition.

Max. score: 8; Neg. score: 2

- A
- B
- D
- C

Q.3 Which of the following are/is true:

A. Every harmonic function on a C^1 domain is of class C^4

B. The unit open disk (planar) has a C^1 boundary which is also Lipchitz.

C. The Harmonic functions in Ω are always bounded.

D. The Harmonic functions in Ω forms an infinite dimensional vector space.

Max. score: 8; Neg. score: 2

- A
- B
- D
- C

Q.4 Which of the following are/is true:

A. A harmonic function in Ω is constant if the maximum is attained on the boundary.

B. There exists a unique harmonic function which is zero on the boundary of Ω

C. Any bounded harmonic function defined on the punctured disk (planar) can be extended to the whole disk such that the extension function is also harmonic.

D. There exists a unique solution to the problem $-\Delta u = u^{-2}$ subject to zero Dirichlet condition.

Max. score: 8; Neg. score: 2

- A
- B
- D
- C

Q.5 Which of the following are/is true:

A. The solution of $u_x + u_y = u^2; u(x,0) = \tanh x$ is unbounded on the curve $y \tanh(x-y) = 1$.

B. Let $f, g \in C^2$ be such that $\begin{aligned} u_{tt} - u_{xx} &= 0;\ x \in \mathbf{R}^n;\ t > 0 \\ u(x,0) &= f(x) \\ u_t(x,0) &= g(x) \end{aligned}$

Then $u \in C^2$.

C. The equation $\begin{aligned} -\Delta u &= f \text{ in } \Omega \\ u &= g \text{ on } \partial\Omega \end{aligned}$ admits an unique solution.

D. The characterestics of $u_{xx} \pm (sech^4 x) u_{yy} = 0$ are given by $y \pm \tanh x = constant$.

Max. score: 8; Neg. score: 2

- A

- B
- D
- C

SAVE SUBMIT