Roll No.....

Total No. of Units : 04
Total No. of Printed Pages : 03

Code No. : 03/203

Third Semester Examination, Dec. 2018

M.Sc. MATHEMATICS

Paper - II

PARTIAL DIFFERENTIAL EQUATIONS

Time : 3 Hrs. **Max. Marks : 80**

- Part A and B of each question in each unit consist of very short answer type questions which are to be answered in one or two sentences.
- Part C (Short answer type) of each question will be answered in 200-250 words.
- Part D (Long answer type) of each question should be answered within the word limit 400-450.

Unit - I

Q.1 A. Write definition of fundamental solution of the Laplace's equation. **(2)**

Q.1 B. Write initial value problem for a backward uniqueness for heat equation. **(2)**

Q.1 C. State and prove the mean-value formulas for Laplace's equation. **(4)**

OR

Derive nonhomogenous problem for heat equation.

Q.1 D. Define transport equation with initial value problem. Explain its nonhomogeneous problem. **(12)**

P.T.O.

OR

Derive solution for of spherical means. Write notation for spherical means.

Unit - II

Q.2 A. Write statement for Lax-oleinik formula. **(2)**

Q.2 B. Write statement for Euler-Lagrange equations. **(2)**

Q.2 C. Derive characteristic ordinary differential equation for nonlinear partial differential equation. **(4)**

OR

Derive A functional identity.

Q.2 D. State and prove the uniqueness of weak solutions. **(12)**

OR

State and prove the uniqueness of entropy solution.

Unit - III

Q.3 A. Write statement of the Plancherel theorem. **(2)**

Q.3 B. Write initial-value problem for a quasilinear parabolic equation. **(2)**

Q.3 C. Write short notes on Legendre transform. **(4)**

OR

Explain potential functions.

$n = 3$

Q.3 D. Derive Bessel potentials. Explain plane and traveling waves, solutions. **(12)**

OR

Derive wave equation from the heat equation.

Unit - IV

Q.4 A. Write initial value problem for stationary phase for the wave equation. **(2)**

Q.4 B. Write statement of Cauchy Kovalevskaya theorem. **(2)**

Q.4 C. Write definition of real analytic function and give example. **(4)**

OR

Derive vanishing viscosity method for Burger's equation.

Q.4 D. Derive Asymptotes for quadratic terms. **(12)**

OR

State and prove the Cauchy data and noncharacteristic surfaces.

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