



THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (2nd Cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4-point scale

Backlog Arrear Examination, March 2021

PGM 4436/4506

Max.Marks:75

Differential Equations

Duration:3 hours

Answer any FIVE Questions:

5×15=75

1. Let $b_1, b_2, b_3, \dots, b_n$ be non-negative constants such that for all x in I $|a_j(x)| \leq b_j$, ($j=1, 2, 3, \dots, n$), $k=1+b_1+b_2+\dots+b_n$. If x_0 is a point in I and φ is a solution of $L(y)=0$ on I , then prove that $\|\varphi(x_0)\|e^{-k|x-x_0|} \leq \|\varphi(x)\| \leq \|\varphi(x_0)\|e^{k|x-x_0|}$ for all x in I .
2. State and Prove the Existence theorem for analytic coefficients.
3. Derive the two linearly independent solutions of the second order Euler equation not containing zero.
4. Derive the Bessel function of zero order of the first and second kind.
5. State and Prove Local Existence theorem.
6. Discuss the solution of linear hyperbolic equations.
7. (i) State and Prove Kelvin's Inversion Theorem.
(ii) Show that the surfaces $x^2 + y^2 + z^2 = cx^{\frac{2}{3}}$ can form a family of equipotential surfaces.