

M.A Semester –II

Assignment

Subject- Mathematics

Course –Ordinary Differential Equations

Subject Course No.-DEMATH2SCORE3

Total Marks-25

Group-A

Answer any one of the following questions (15 marks)

1. State and prove Picard's existence and uniqueness theorem of the initial value problem $x'(t) = f(t, x), x(t_0) = x_0$.
2. Obtain the power series solution of the Legendre equation $(1 - t^2)x'' - 2tx' + p(p + 1)x = 0$ where p is a constant. Deduce that the power series solution of the Legendre equation is the sum of a polynomial of degree p and a power series, when p is a positive integer.

Group-B

Answer any one of the following questions (10marks)

1. Discuss the elementary and orthogonal properties of the Bessel functions of the first kind.
2. Let $\Phi(t)$ be the fundamental matrix of the homogeneous system $x'(t) = A(t)x(t), t \in I$. Then show that ψ defined by $\Psi(t) = \Phi(t) \int_{t_0}^t \Phi^{-1}(s)B(s)ds, t \in I$ is a solution of the initial value problem of the non-homogeneous system $x'(t) = A(t)x(t) + B(t), x(t_0) = 0$.