
MTL712 (Computational methods for differential eq.) IITD MINOR 1 EXAM

Duration of Examination: 1 hour

August 2023

Instructions

1. The total number of points is 25 (points are indicated in the margin).

-
1. Prove that the Implicit Euler method applied to the initial value problem

$$y' = \lambda y, \quad y(x_0) = y_0,$$

converges and the global error (e_n) is $O(h)$.

2. Determine the coefficients in the two-step LMM

$$y_{n+2} + \alpha_0 y_n = h(\beta_1 f_{n+1} + \beta_0 f_n)$$

so that it has as high an order of consistency as possible. What is this order and what is the error constant for the resulting method?

3. (a) Find the interval of absolute stability of the 2-step Adams-Moulton AM(2) method: [5]

$$y_{n+2} - y_{n+1} = \frac{h}{12}(5f_{n+2} + 8f_{n+1} - f_n).$$

- (b) Which one of the AM(1) and AM(2) methods is more suitable to apply to the problem: [4]

$$y' = -800y$$

$$y(x_0) = y_0$$

and why (neglecting the accuracy concern).

